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# American Cinematographer

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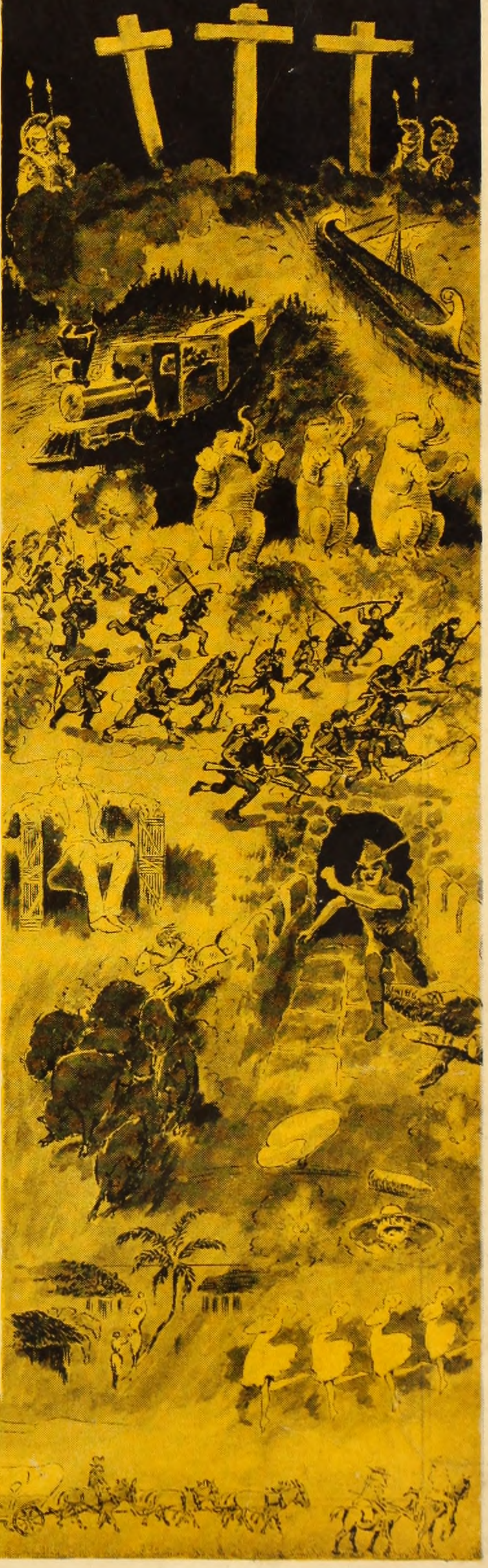

Dec, 1927

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*Where Men Interested In Photography*
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Hollywood, Calif.

**Vol. VIII** **December, 1927** **No. 9**

# *American Cinematographer*

SILAS EDGAR SNYDER
Editor and General Manager

JOSEPH DUBRAY
Technical Editor

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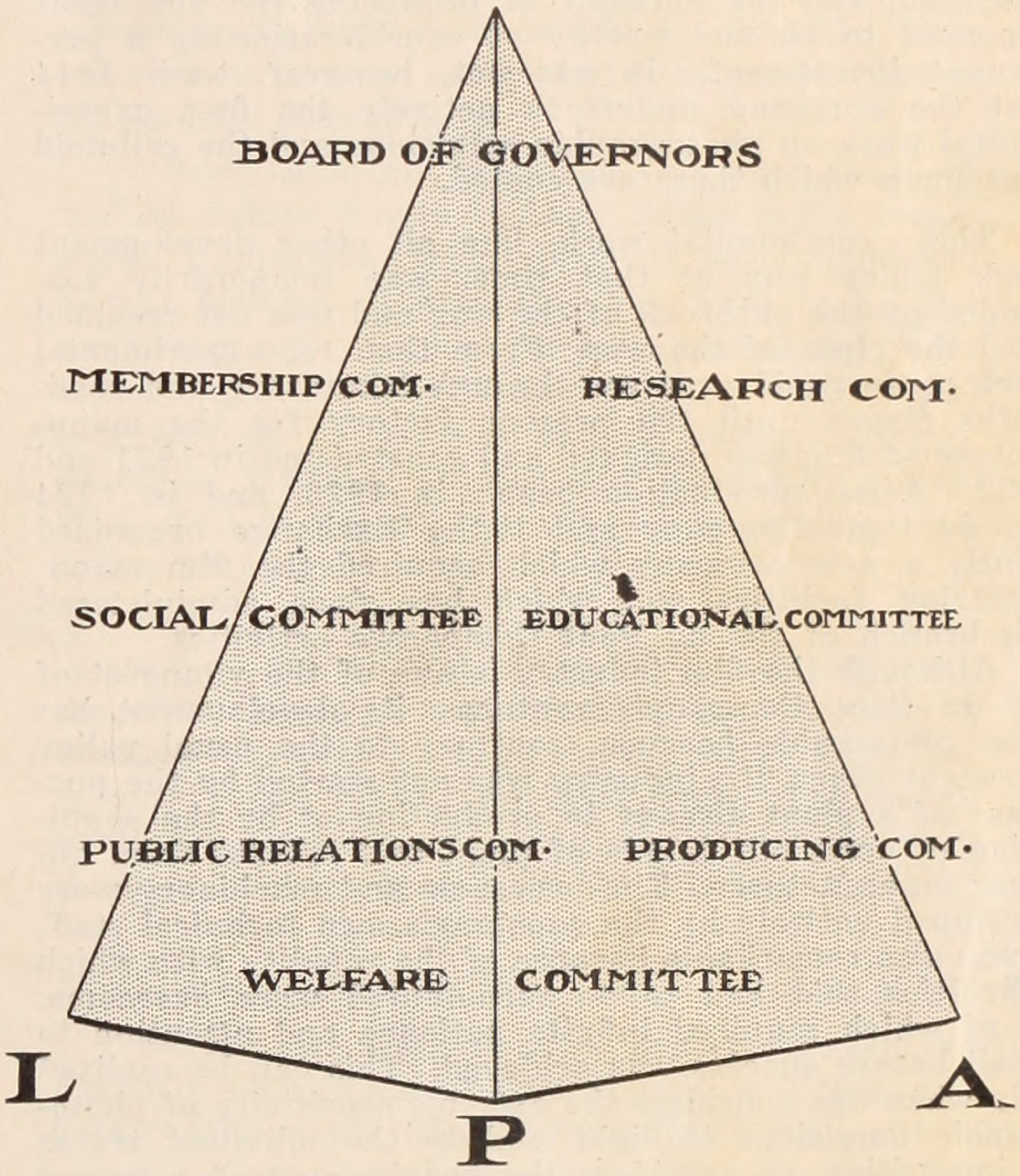
## *A. S. C.*

### *The Pyramid of Progress*



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# Motion Picture Film

## *The Du Pont Company Sought Another Outlet for Cellulose Products and That Is Why, Today, Du Pont-Pathe Film Is Contributing Pleasure to Millions*

*By* George R. Rocker
Assistant to the President, Du Pont-Pathe Film Manufacturing Corporation

About fifteen years ago the du Pont Company, in accordance with its established policy of developing the field of industrial products made from cellulose, began to study the possibilities of the motion picture film, which was then a comparatively new invention. The large field for use of motion picture film in the theater, the home, the school, and in industry was easily appreciated, and the industry of producing the film itself appeared to be one worthy of consideration as a permanent investment. It was not, however, until 1914 that the company undertook actively the first experimental work on photographic emulsions and the celluloid base upon which these are coated.

This experimental work, like all other development work under way at that time, was temporarily suspended on the outbreak of the war and was not resumed until the close of the war. From then on, experimental work made rapid progress through laboratory and semi-works stages until the present factory for the manufacture of film was designed and constructed in 1921 and 1922. Active production began in 1923, and in 1924 the du Pont Company and Pathe Exchange organized jointly a new company which acquired the film manufacturing facilities and which has since administered this branch of the du Pont Company's activities.

Although the film industry is one of the youngest of the du Pont Company's ventures, its development has been remarkable because, contrary to the usual policy in recent years, the industry was not started by the purchase of a plant already in production or by the acquisition of complete details of plant and process from another manufacturer. The processes and machinery were developed entirely by the company's own technical staff. It was also remarkable because of the rapidity with which difficulties that had to be surmounted were overcome, all of which required infinite patience and attention to detail before success was achieved. This can be realized only when one considers the extreme sensitivity of photographic emulsions to light and to the minutest traces of impurities, or considers the requirements for proper speed and contrast upon which depend not only the registration of the image, but also the proper values of high lights and shadows.

In the manufacture of motion picture film the celluloid base or carrier for the emulsion is produced by casting solutions of nitrocellulose and camphor continuously upon a rotating drum. As the drum turns, the solvent used in making the solution is evaporated and a sheet of celluloid remains on the wheel. This sheet, before the drum makes a complete revolution, is sufficiently dry and tough to permit of stripping and is removed from the drum as a continuous endless sheet. After further drying, this sheet is wound up in large rolls which then go to a coating machine. On this machine the roll is unwound and the sheet is coated with a continuous layer of a silver halide gelatin emulsion. From the coating machine, the film passes into drying chambers, where it is dried and rewound. This coated roll is then slit into narrow widths, one and three-eighths inches wide, the standard width of professional motion picture film. The narrow rolls then pass to machines which punch small perforations on each edge of the film to fit the sprockets of motion picture cameras and projectors. The film in narrow roll form is then inspected and packed in light-proof containers. Operations from emulsion coating on are conducted in "dark rooms," where only a faint green light is permitted; also, all operations including the coating of film are conducted in rooms kept scrupulously clean, for even the smallest particle of dust on the film may injure the emulsion or may be magnified to a large spot on the projection screen.

At the present time the company is producing negative and panchromatic negative, positive and negative 16 m. m. and portrait.

There is probably no product of the chemical industry which today touches the minds and activities of mankind in so many and varied ways as the motion picture film. In the theater it has become a medium of dramatic expression with possibilities beyond those of the ordinary stage, because of the wide scope of its settings. It interprets and visualizes events and characters of drama, fiction and history. As a medium of portraying visually all that is best in literature it is unsurpassed. It appeals to the illiterate as well as to the educated. In another field, the recording of current events, it supplements the daily newspaper by bringing to every community living pictures of occurrences from all over the world. In the form of news reel it has been perhaps the most powerful educational force in recent years. Travel has always been considered educational, and travel with the news reel, which is not limited to the traveler's purse, and which millions of people enjoy daily, certainly has its broadening effect.

As an educational medium motion picture film is also playing an increasingly important part in schools and colleges, and some of the larger cities now have so-called departments of visual education. In many branches of biology, chemistry, physics, astronomy, ethnology and psychology, motion picture film is used extensively to record phenomena. In engineering, architecture, manufacturing industries and in other applied sciences, records are made of machine motion, of progress in construction or of unique processes, and such records are kept for study. As a medium for recording vanishing wild life, the habits and customs of fast-disappearing primitive races, or the rapidly-changing aspects of our present civilization, the film is of great value. In the practice of medicine its use for recording special phenomena or the progress of disease is becoming daily more important.

Motion picture film is finding large fields of usefulness in advertising, in safety campaigns, in office work, and finally, in the every-day life of the home, in recording events in the lives of children, or of anniversaries, weddings, fishing trips, vacation days, school or college sports. In undertaking its manufacture the du Pont Company has therefore entered a field which should not only afford a permanent outlet for cellulose products, but one which touches practically every side of human life.

# *EDITORIAL--The Voice of the A. S. C.*

When Dr. Kenneth Mees, Chief of the Research Department of the Eastman Kodak Company, appeared before the open meeting of the A. S. C. at the Hollywood Chamber of Commerce, on Monday night, November 7th, he won a home in the hearts of all who heard the lecture.

The laboratory operatives were guests of the A. S. C. and after Dr. Mees had finished his blackboard talk, President Dan Clark, of the A. S. C., invited the assembled cinematographers and guests to "go to the mat" in discussion of the points brought out in Dr. Mees' address, and to bring up any subject that might be of personal interest appertaining to photographic or laboratory practice.

As Dr. Mees had graciously offered to answer questions he was bombarded by a rapid fire of interrogations covering a wide range of points and the discussion became general. The frank, spontaneous and good-natured exchange of views in which Dr. Mees freely participated, even after he had left the platform, had the effect of bringing about a better understanding between the laboratory men and the cameraman, and the feeling engendered was so friendly and generous that the sentiment was expressed by President Clark that the A. S. C. hoped very soon to see the laboratory men enrolled among the membership of the Society and this sentiment was echoed from the floor.

Because of lack of time no attempt is made to publish a resume of Dr. Mees' remarks, but in the January issue of THE AMERICAN CINEMATOGRAPHER we hope to present with diagrams the substance of his talk.

Dr. Mees is a happy talker. He is natural, eloquent, straightforward, sure of his subject, graceful in presentation and he possesses a sense of humor and good fellowship that gives his picture of hard technical facts a setting at once charming and refreshing.

We cannot, however, refrain from quoting our distinguished guest in the prefactory remarks to his address, wherein he paid this wonderful tribute to the A. S. C., for which President Clark, the Board of Governors and the members of the Society are deeply grateful. He said:

**"YOU GENTLEMEN HERE ARE KNOWN THROUGHOUT THE WORLD WITHOUT ANY DISPUTE OR QUESTION AS THE GREATEST EXPONENTS OF THE ART OF PHOTOGRAPHY —THERE IS NO QUESTION ABOUT IT—THE CAMERAMEN OF HOLLYWOOD ARE THE GREATEST KNOWN IN THE ART OF CINEMATOGRAPHY—IN THAT FIELD YOU ARE SUPREME."**

Come again, Dr. Mees. Come often and come soon.

In his article, "Hollywood in 1952," in the November Cinematographer, President John Camphouse, of The Bank of Hollywood, said:

"Look again and see here fifty more theaters; a great Aviation Union Station, where all transcontinental passenger, freight and mail air lines will center; a wonderful art palace housing the exhibits of Hollywood artists; sunshine factories turning out half a billion dollars worth of manufactures entirely aside from the product of the motion picture studios which will have evolved into something as much more wonderful than the present motion picture as the latter is more wonderful than the stereopticon.

"More than ten years ago the press agent of the old Balboa Studio at Long Beach had a dream about a machine with which three dimensional motion pictures in natural colors were to be disseminated with musical accompaniment by radio from central stations to thousands of motion picture screens in theaters and in homes, colleges, churches, hospitals, prisons and other institutions. Who shall say that this will not be a fact long before 25 years?"

Mr. Camphouse has already turned out to be "a prophet not without honor," for only this week the editor hears of a program now in process of working out which is almost identical with the dream of the Balboa publicity man. The movie world may prepare for amazing and revolutionary changes in every branch of the industry.

---

TO OUR READERS AND MEMBERS OF THE A. S. C.:

During this, the transition period between the AMERICAN CINEMATOGRAPHER as it was, and THE AMERICAN CINEMATOGRAPHER as it is planned to be, the editor earnestly requests the indulgence of our readers as well as the members of the A. S. C.

Because of necessary changes and pressure of matter long delayed, together with our limited space, it has been necessary to postpone the publication of much excellent material especially personal matter regarding the activities of the membership.

By the first of 1928 we hope to have our new type dress ready and to be able to increase the size of our magazine to accommodate our increasing advertising and the new features to be added, among which latter are a department for the transactions and activities of the Society of Motion Picture Engineers and a department for the Amateur Cinematographer.

We especially regret the necessity for the curtailment, in this issue, of "In Cameraformia" and our department of "Questions and Answers."

Thank you.

# Panchromatic Film

## Mr. Physioc Answers That Insistent Question: "What Is This Film We Hear So Much About"?

*By* Lewis W. Physioc

There has been a great deal, already, written about this panchromatic stock, but when we hear the varied opinions as to its value, and the different ideas of its treatment we are impressed with the fact that there is little danger of exhausting the study of this very important development in motion picture photography.

This multifarious valuation among cameramen and laboratories is evidenced in the fact that there is almost as great variety of treatment as there are individuals manipulating it; consequently, there may develop a danger of sacrificing its broad values by improper treatment. There are cameramen who are timidly subjecting it to the same process as the ordinary emulsion, using no filters and exposing it to the same quality of light as with the ordinary emulsion, there are others, on the contrary, who are reckless in the use of filters, while some are still doubtful about the important question of make-up.

**Lewis W. Physioc**

These facts, naturally, arouse in the minds of those not engaged in the photographic department, the current question: "What is this panchromatic film we hear so much about, these days?"

The question is an important one and should be answered, especially for the benefit of those who are paying for the use of this highly perfected but delicate and exacting stock. Delicate, because of the difficulties of its manufacutre and its great sensitivity, and exacting because it demands a thorough knowledge of its use on the part of the cameramen, and laboratories that have to process it.

First, let us consider some of the reasons for its adoption.

Considering photography, as a whole, we must realize that despite the fact that it is a beautiful and wonderful art, it has its limitations and weaknesses, especially when working with the ordinary emulsion employed before the development of the panchromatic stock. Very often the perfect photograph is the result of chance conditions, except when the operator has at his disposal the proper equipment, as provided in the various studios.

It may be enlightening to review some of these difficulties.

1st. The lights of a subject are, usually, of a very high key compared to the luminosity of the shadows and to treat one correctly is to sacrifice the other, producing unpleasant contrasts. The remedy for this is the proper use of the above mentioned studio equipment, i. e., lowering the key of the high-lights by the use of screens and diffusers and illuminating the shadows by aid of reflectors and the proper placing of lights, all of which requires considerable experience and artistic taste.

2nd. Flat Lighting nearly always results in a very uninteresting picture. The subject may be sufficiently illuminated but so uniformly and highly diffused in all directions that the picture will be devoid of any relief, or what the artist terms chiaroscuro. This effect may also result from a poor rendering of color values. The remedy for flat lighting, where conditions cannot be improved by artificial equipment, is a minimum exposure with a maximum development. Panchromatic stock also improves this condition by furnishing more pleasing contrasts through a more perfect rendering of color values.

3rd. Modeling, is the antithesis of flat lighting and is an element highly important in photography and is difficult to achieve, especially in close-ups, because if it is carried the least bit to the extreme, harshness is produced and smoothness and delicacy of skin texture destroyed. However, without modeling, true portraiture is impossible, expression lost, and individual beauty and perfection in the mould of features sacrificed. Panchromatic film will often enhance the most delicate modeling because shading is often produced in color values, lost to the ordinary emulsion, and blotches and excrescences in the skin are smoothed out considerably by the use of panchromatic film.

4th. Color rendering is, also, a source of great worriment to the photographer, for, frequently, the excellence of the picture, in all of the above elements, is dependent upon a proper rendering of color values. Panchromatic film is the solution of this problem.

5th. Composition is the keynote of this beautiful tonic chord we call the picture; we can see, therefore, how it, in turn, must be influenced by the foregoing elements, as composition includes line, color harmony, lighting and modeling.

It is easy to understand, then, why a progressive cameraman should demand something that will enable him to reduce some of the weak spots of his medium and allow him to satisfy his ambition for greater excellence of expression. The result of this demand is panchromatic stock, a generous and able response on the part of the manufacturer; generous because of the tremendous additional expense and equipment necessary to produce it in large quantities, and able because of its great delicacy and the difficulties of its process of manufacture.

This stock differs from the ordinary stock in its range of sensitivity to the various colors, especially the reds, greens and yellows. This fact, however, introduces difficulties in the handling of it that we must take into consideration. The ordinary emulsion, being sensitive to one portion of the spectrum (the blue section) can be manipulated safely in red light whereas, panchromatic film being highly sensitive to the red rays is limited to the very poor illuminating properties of a certain green light and greater safety demands total darkness in the developing room.

In balancing expectations against disappointments, even with this great improvement in the photographic emulsion, we must take all of these difficulties into consideration, for we must remember that while rendering the reds, greens and yellows more perfectly the blues are yet very persistent and will continue to tantalize the photographer unless he finds a means of curbing them. This we treat under a proper paragraph. And further, while it relieves the cameraman of some of his worries it increases those of the developer; but we are ever progressing, and the time is not very remote when ali of these difficulties will be taken care of by nearly automatic treatment.

Panchromatic film is obtained by treating the ordinary emulsion with certain dyes, known to chemists as the Isocyanine derivatives; cyanin, a peculiar blue and pinacyanol, a purplish tint, and even greater range may be obtained in the orange, yellow and green by the use of pinaverdol, and dicyanine will even render, somewhat, the infra-red rays. The film is bathed in these dyes and dried in the dark, and they may even be incorporated in the emulsion during the process of manufacture. Indeed, the excellent keeping quality of the present panchromatic stock leads us to believe that the latter method has been highly perfected. Even greater sensitivity may be obtained by hyper-sensitizing solutions of ammonia and silver salts. This latter emulsion has so great a range that excellent renderings may be had without the aid of filters, thereby permitting very rapid exposures. However, this latter process provides a highly delicate fugitive material, and is seldom employed except for special night effects and for natural color photography. But there is no telling to what degree of excellence the modern scientist may develop even this latter process.

The action of these dyes is a very peculiar phenomenon and seems to be more the result of persistent experimentation than of axiomatic equation, and is, even yet, imperfectly understood. Chemists do not feel quite certain as to whether these dyes form direct compounds with the silver or whether the process is purely physical or pigmentary; however there is a certain modification in the character of the silver compounds in the emulsion that supports the theory that there is a positive reaction between the dyes and the silver, forming very complex combinations. This is further substantiated by the very remarkable nature of silver in reaction upon which the whole art of photography is founded. Others hold to the opinion that these dyes merely have a peculiar physical property of absorbing and holding in storage radiant energy.

Now it appears that one of the inviolable rules of progress is that each improvement must have its attendant problem; in fact, it is the final solution of this problem that leads to further achievements. This is none the less true in the case of panchromatic film. Having found that this stock considerably humors the red, green and yellow rays, we are confronted with fact, as before mentioned, that the blue and violet still remain powerful and troublesome. It is similar to adding one chemical solution to another to form a desired precipitate; we must filter off one before we can use the other. We must ,therefore, resort to some means by which we can curb the power of these blue and violet rays, and we find this can be done by the use of filters, i. e., colored mediums, placed between the subject and the film, either in front of the lens or back of it or even between the elements, near the diaphragm.

Here, the aforesaid law of development again asserts itself, for it introduces a subject that causes the heart to quicken. The colored filter plus the panchromatic film takes the photographer out of the limits of the monochrome artist and adds to his profession the study of the theory of color, a very coquettish mental companion. But without a little knowledge of the study of color, panchromatic film may lead one into a maze of difficulties.

In the study of color we are confronted with the proposition of a very complex theory quarreling with common observation, and it is very puzzling to those not of a scientific turn of mind, or who have not kept pace with modern physical research along these lines and who are apt to revert to early text books that have left them with the old idea of the three primaries red, blue and yellow, the mixture of which was supposed to produce white when considered as light, and mixed, in the form of pigments, produced black. The modern scientist discounts, to a great extent, this theory and accounts for each color by a definite wave frequency. Even at the present time, however, there is some uncertainty in the case of yellow, which is still puzzling, and which the earlier students despite their error, balanced well, in many ways, as a primary, but which is now accounted for as a mixture of red and green light.

The scheme is further complicated by the terminology. This is due to the fact that we are accustomed to compare and name colors according to the standard of the common pigmentary elements, because they are well defined and distinct in character. The very small child can call off blue, red or yellow, but immediately we stray from the primaries and consider the secondary and tertiary mixtures we can no longer give positive terms to a given tint; hence the distracting expressions such as yellow greens, golden yellows, orange, etc., each of which may be calculated from the first section of the spectrum from positive red to the so-called purples, between the extremes of pure red and pure blue and the variety of blues, blue-greens between the blue and green sections. From this, we come to the conclusion that the only way in which we can actually define a color is to compare it to the spectrum and the actual wave length will show whether it approaches a pure primary, as commonly known, or whether it belongs to the secondary or tetiary mixtures.

So that instead of venturing a name that might mean any gradation between these various sections of the spectrum, we study the findings of the scientist, as given below.

Considering colored light as a wave of a given length, vibrating with a given frequency, i. e., the number of waves passing a given point so many times per second; and calculating from the basis of the known fact that all of the waves (white light) travel at a speed of 186,000 miles per second, we are furnished with the following tables.

**Wave Length**

| | |
|---|---|
| RED (Approximately) | 34,000 to the inch |
| ORANGE (Approximately) | 37,000 to the inch |
| YELLOW (Approximately) | 42,000 to the inch |
| GREEN (Approximately) | 48,000 to the inch |
| BLUE (Approximately) | 51,000 to the inch |
| INDIGO (Approximately) | 61,000 to the inch |
| VIOLET (Approximately) | 64,000 to the inch |

**Frequency**

| | |
|---|---|
| RED (Approximately | 400 billion per second |
| ORANGE (Approximately | 440 billion per second |
| YELLOW (Approximately) | 500 billion per second |
| GREEN (Approximately) | 570 billion per second |
| BLUE (Approximately) | 600 billion per second |
| INDIGO (Approximately) | 700 billion per second |
| VIOLET (Approximately) | 750 billion per second |

And, further, Prof. Grunberg has worked out the following numerical units where mathematical equations are desired to prove the complements and certain combinations.

| | | |
|---|---|---|
| RED | Wave length | 0.656 |
| ORANGE | Wave length | .608 |
| YELLOW | Wave length | .576 |
| GREENISH YELLOW | Wave length | .564 |
| GREEN | Wave length | .524 |
| GREENISH BLUE | Wave length | .492 |
| BLUE | Wave length | .483 |
| INDIGO | Wave length | .462 |
| VIOLET | Wave length | .433 |

The study of these figures will readily show us the difficulty of naming colors, but observing the ratio between each group will, however, enable us to approach, very nearly, a satisfactory definition. For instance, in the range between red and yellow, if we match a tint between 656 and 608 we might safely call it red because it is well beyond the yellow, past the orange and approaching very near to the pure red.

The theory of color is very puzzling to some artists who are not scientifically or mathematically inclined and who think of color in terms of pigments. It is difficult for them to conceive of green being an element, or yellow as a mixture. They reason, that there being nothing on their pallet that they may mix to produce red, blue or yellow, they will accept these as the primaries because, with these, they can mix any desired tint, from the secondaries, commonly called orange, green or purple, and further into the tertiaries, and infinite varieties of grays. So they continue to smile at these complicated technicalities and revel in their pigments.

Panchromatic film, without the use of filters, is not very satisfactory, except in interior work with the warm quality of the incandescent light now being adopted by some of the better informed cameramen. Without the use of filters, or the proper quality of light, the virtue of panchromatic film is somewhat sacrificed, because if development is carried sufficiently to profit by the correction in the reds, greens and yellows, the blues and violets continue to develop up in tremendous proportion and we are apt to produce the same unpleasant lack of balance as with the ordinary emulsion, with just a slight improvement in the reds. Now we must resort to our-above mentioned simile of the chemical precipitate; we must filter out some of these powerful and troublesome

*(Continued on Page 22)*

# "It Is In The Box"

## An A. S. C. Man Finds Shooting Movies In Japan Nothing Like The Good Old U. S. A.

*By* ALFRED GOSDEN, A. S. C.

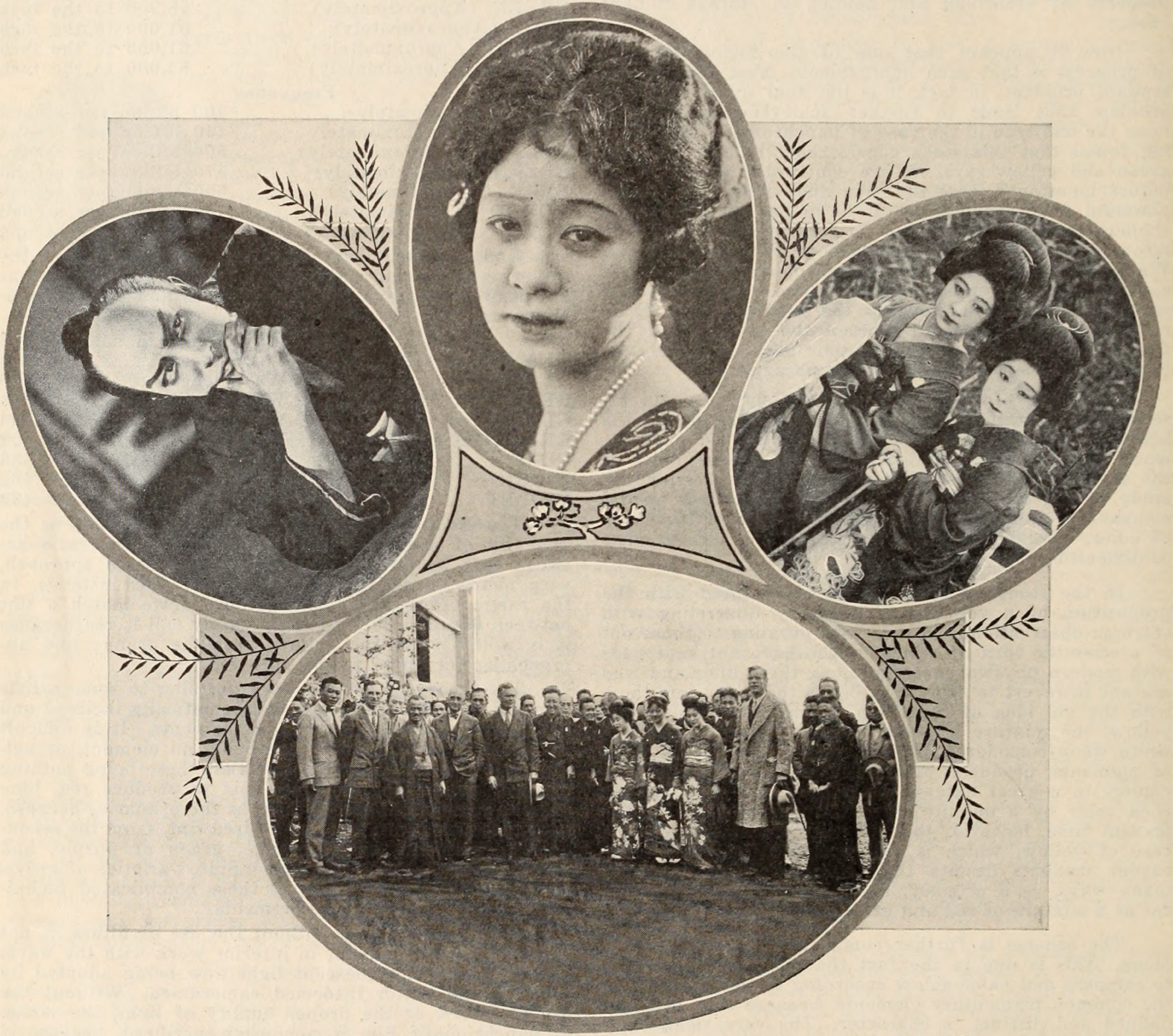
"HAKO NO NAKA NI ARIMASU!"—This strikes me as being quite an original main title and translated from Japanese into English means "It is in the box" to which I advisedly add "Maybe." I qualify the remark because when we arrived at the Bantsuma-Tachibana .Universal Studios in Uzumasa near Kyoto, Japan, we found working conditions what I may call elementary. I was going to say chaotic, but that would not be quite just, for I believe that they were doing the best they knew how according to their knowledge and experience.

Our small company consisted of Jay Marchant in charge of production, Al. Boeckmann, electrician, with Harold Smith and myself looking after their knowledge and experience.

We were sent to Japan in an advisory capacity from Universal City, but actually were in the point employ of Universal Pictures (Japan Ltd. and the Bantsuma-Tachibana Co., the former a releasing company and the latter a producing company with studios at Uzumasa.

The principal items of the apparatus that accompanied us were four Bell and Howell cameras (one with high speed attachment) one Akeley, one Eyemo, a Duplex printing machine, about forty side arcs, two rotary spots, and several other spots, I forget exactly how

(Continued on Pages 16 and 17)



*Top, left to right—Bantsuma-San, leading man; Gomei-San, star; Izumi-San and Mori-San, featured leads. Below—Personnel and stars of Bantsuma-Tachibana Studios at Uzumasa. Mr. Gosden is fourth from the left in the front row*

# IN CAMERAFORNIA

Our beloved Tony Gaudio, A. S. C., is temporarily confined to his home convalescing from an operation.

Reggie Lyons, A. S. C., is back from a sojourn to New York where he looked over all the good Broadway shows and some not so good. Mr. Lyons is back home on the Fox lot.

Shooting has started at the Metropolitan Studios on the McConnell Production, for Pathe release, in which "Thunder," the police dog, is featured. Harry H. Cooper, A. S. C., is chief cinematographer.

Howard Hughes has started production on "Hell's Angels," a British air force story, for United Artists release. Harry Perry, A. S. C., who was chief cinematographer on "Wings," is in charge of photography on this new air picture. Luther Reed is directing.

The aerial photography on the Universal comedy, "The Cohens and Kellys In Paris," was recently completed by William S. Adams, A. S. C. This feature is being produced under the direction of William Beaudine. It is of interest to note that in the last five air pictures which Adams has photographed, Art Goebel, winner of the Dole prize for the trans-Pacific-Hawaiian flight, has been pilot of the camera planes.

Alvin Wyckoff, A. S. C., has added to his already valuable photographic paraphernalia one of the finest camera equipments ever turned out by the Mitchell Camera Corporation of Hollywood. When Alvin quit ordering he had purchased every instrument and appliance turned out by this organization. Mr. Wyckoff is now the possessor of one of the finest cinematographic and still equipments in the industry.

Glenn R. Kershner, of Culver City, has been selected to do the camera work for the Pathe-Bray Colorado River Expedition with Leigh R. Smith as director. The expedition will go by train to Green River, Utah, where the boatmen and chief engineer of the previous National Geographical Expedition will meet them, load their equipment in boats and start on their wonderful trip down the Colorado River to the Grand Canyon, coming out at the El Tovar Hotel. One of the interesting features of the trip will be the broadcasting of each day's progress and location by government experts. Mr. Kershner is a member of the American Society of Cinematographers and the Two-Thirty-Three Club of Hollywood.

"Wings," Harry Perry's latest oeuvre, has soared to its second sensational success, according to "Paramount New."

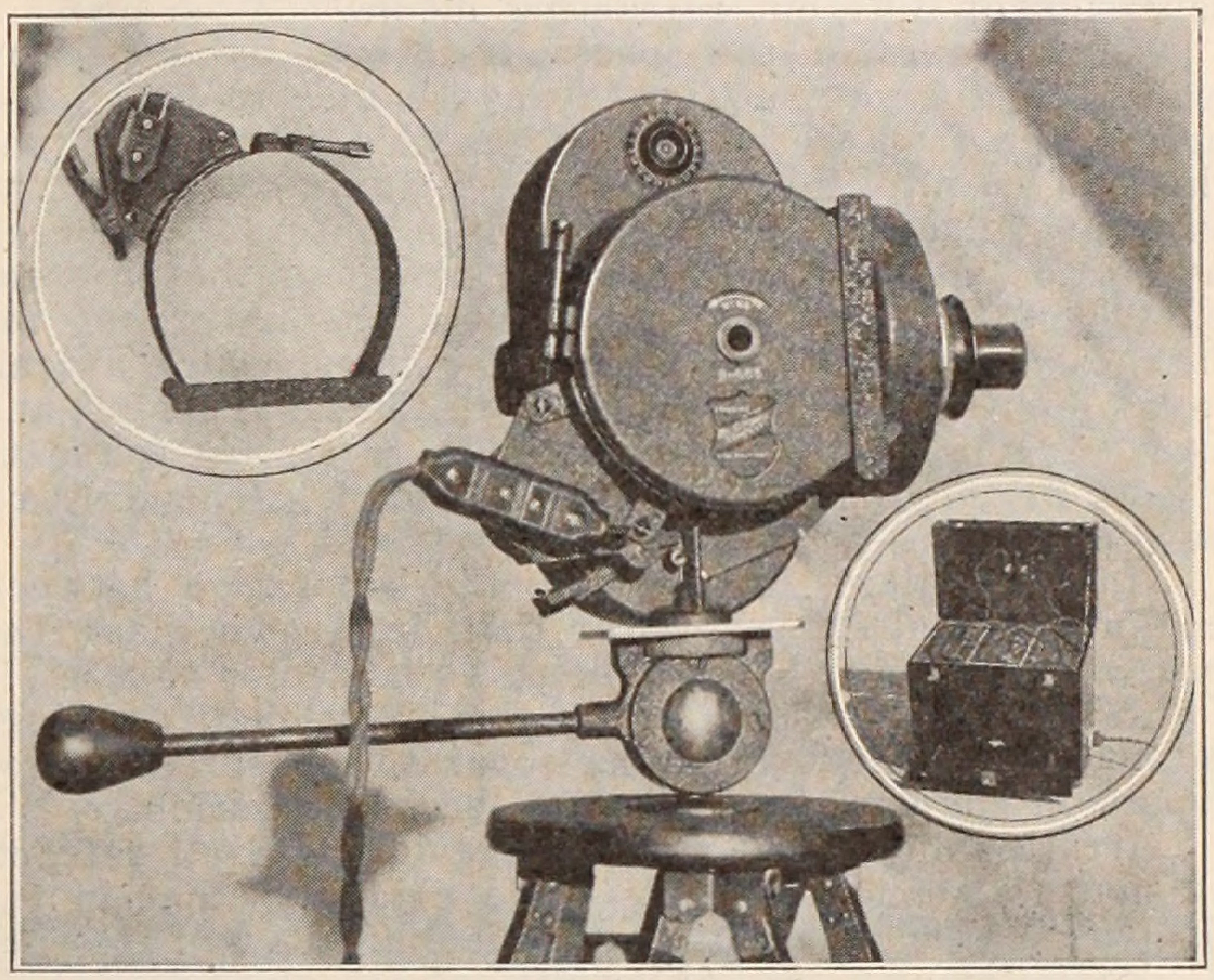
Opening at the Erlanger theater in Chicago, October 30th, it has swept the midwest metropolis by storm, arousing even greater enthusiasm than it did in New York, where it is now in its thirteenth week, with standees at every performance.

The film is being given the same marvelous presentation as in New York, with the enlarged screen and the tremendous sound effects developed by Roy Pomeroy and his staff. Without exception, the reviewers of Chicago paid high tribute to the perfection of the presentation, which plays so big a part in the success of "Wings."

## By Remote Control

By Chas. G. Clarke, *Sec'y, A. C. S.*

The accompanying photographs illustrate an electric magnet device used for operating an Eyemo camera by remote control. It is used in making hazardous shots, natural history subjects, and for operating a camera in any position where it would be impossible for a human operator to be with it, such as from a fragile boom, wires, slides, etc. It is made by Fred Hoefner, 5319 Santa Monica Boulevard, Hollywood, from ideas originating with Chas. G. Clarke. It can be fixed to any Eyemo camera, alterations to the camera being unnecessary.



This device was used with success by Mr. Clarke for photographing the latest "Red" Grange picture, "A Racing Romeo." Scenes were taken from angles heretofore impossible. In some of the racing shots the camera was suspended across the road just above the drivers heads. On the screen this gave the thrilling effect of driving right into the spectators. It was also set up on the racing cars themselves, photographing the drivers with the whizzing scenery for background. The drivers pushed the switch, when the high speed was developed, before going into a crash or when the proper background was reached. While making these close-up shots other cameras were photographing the same action from different positions along the roadside, but the Eyemo on the car was inconspicuous because of its small size. This indicates how it may be used by professional motion picture cameramen.

For the amateur it opens up a great field of natural history subjects. For example a camera with this attachment could be set up and focused on a bird's nest or like subject, then by means of an electric cord connecting with the operator who is out of sight and hearing, the motor is set in motion when the bird appears at the nest. Light spring connections can be made so that the animals themselves make the closed circuits and photograph themselves. The resulting pictures would be of better quality and perspective than those flattened field pictures obtained when using telephoto lenses from a distance.

This device operates on 110 volts direct current, and when away from the studio Mr. Clarke uses the illustrated battery box which holds three 45-volt Radio "B" batteries. It has a volt meter built in and a drawer for cable. This is the same outfit carried to supply current for the Cinemotor on the standard camera.

For those wishing to operate the magnet from the batteries of their car it can be wound for 6 volt batteries.

# Amateur Cinematography

## A Professional's Notes for Amateurs—XIV

By Joseph A. Dubray, A. S. C.

*(Continued from November Cinematographer)*

In the investigation concerning the possibilities of correcting the "chromatic aberration" of lenses, the conclusion was reached that a combination of two lenses of opposite power and of suitable material, would bring nearly to a single focal point the coloured rays comprising the spectrum, without destroying refraction.

In reality, a complete focusing of all of the rays of the spectrum is a physical impossibility, due to the IRRATIONALITY OF DISPERSION, which is the term used to denote the lack of uniformity found in the dispersion of different refracting media.

The colours of the spectrum formed by dispersion through a glass prism, are always found to be in the same order from red to violet, as this splitting of the white light into its components is due solely to the different velocities acquired by the different coloured rays in the medium glass, but the extent of the different regions of the spectrum varies with the nature of the glass, and therefore the Fraunhofer lines, which are always to be found to correspond with the same colour, and always in the same rotation from A to H, are found to be at different distances from each other, depending on the composition of the glass.

In Flint glass, for instance the separation between the lines G and H, is greater than in Crown glass, the spectra of these two glasses, being equalized as to size.

It is quite evident that this irrationality brings about the necessity of making separate measurements of dispersion for each substance under investigation.

Irrationality of dispersion is evident in all refracting materials and it results quite evidently that in the construction of an achromatic doublet it is necessary to choose among the different optical glasses, a pair which show such similarity in their irrational behavior, that their irrationalities will as far as possible neutralize each other.

Optical glass manufacturers have devoted great time and prolonged efforts in the production of glasses which would put at the disposal of the designer and calculator of optical instruments, a great variety of glasses having different values of mean dispersion (the **n** value mentioned in the November number of the "American Cinematographer") among which they could choose the most appropriate for each particular need.

After Newton's contention in reference to the proportionality of refraction and dispersion had been demonstrated erroneous, and John Dollond, an English optician, had succeeded in 1757 in making achromatic combinations, with the glasses then available, Fraunhofer foresaw the possibility of incorporating in the glasses other elements in order to change their destiny and therefore their refractive and dispersive powers. His work was followed by investigations, by Faraday, Harcourt, Stokes and others who could obtain glasses better apt for the correction of chromatic aberration and until the year 1886 France and England held the supremacy in optical glass making.

In 1886, Schott and Abbe introduced into practical optics the famous Jena glasses and published their first catalogue, which included not less than 44 different glasses of which 19 were of entirely new composition.

Abbe and Schott results were obtained, after several years of patient scientific research, by incorporating in the glasses certain elements such as boron, zinc, cadmium, phosphorous, lithium, magnesium, bismuth, antimony, arsenic, fluorine, etc., etc. and by the scientific improvement of the manipulation of the component of the glass during the process of manufacture.

Abbe's and Schott's remarkable achievements started a new impulse in optical science and in the domain of photographic objectives a great number of constructions were rendered possible.

The mathematical investigation carried on, in view of the correction of the chromatic aberration, proves that two glasses will be better adapted to this scope, the less they differ as regards the values **a**, **b**, **g**, and the more they differ as regards the value **n** (See November issue of the "American Cinematographer").

In spite of the great variety of glasses known at the present day, the irrationality of dispersion, always present, does not permit perfect achromatism but for two of the coloured rays of the spectrum, and in some cases for three of them, to the sacrifice of other very valuable properties of the glasses.

When only two of the coloured rays are brought to a common focus, the remainder of the rays of the spectrum, are called the SECONDARY SPECTRUM and TERTIARY SPECTRUM is the appellation of the remaining rays when three of the colours of the spectrum are achromatized.

The existence of a secondary spectrum, is, of course, impairing the orthoscopy of the image produced by a photographic objective, but to a very little extent and if the two rays brought to a focus are carefully selected, the remaining chromatic aberration can be neglected.

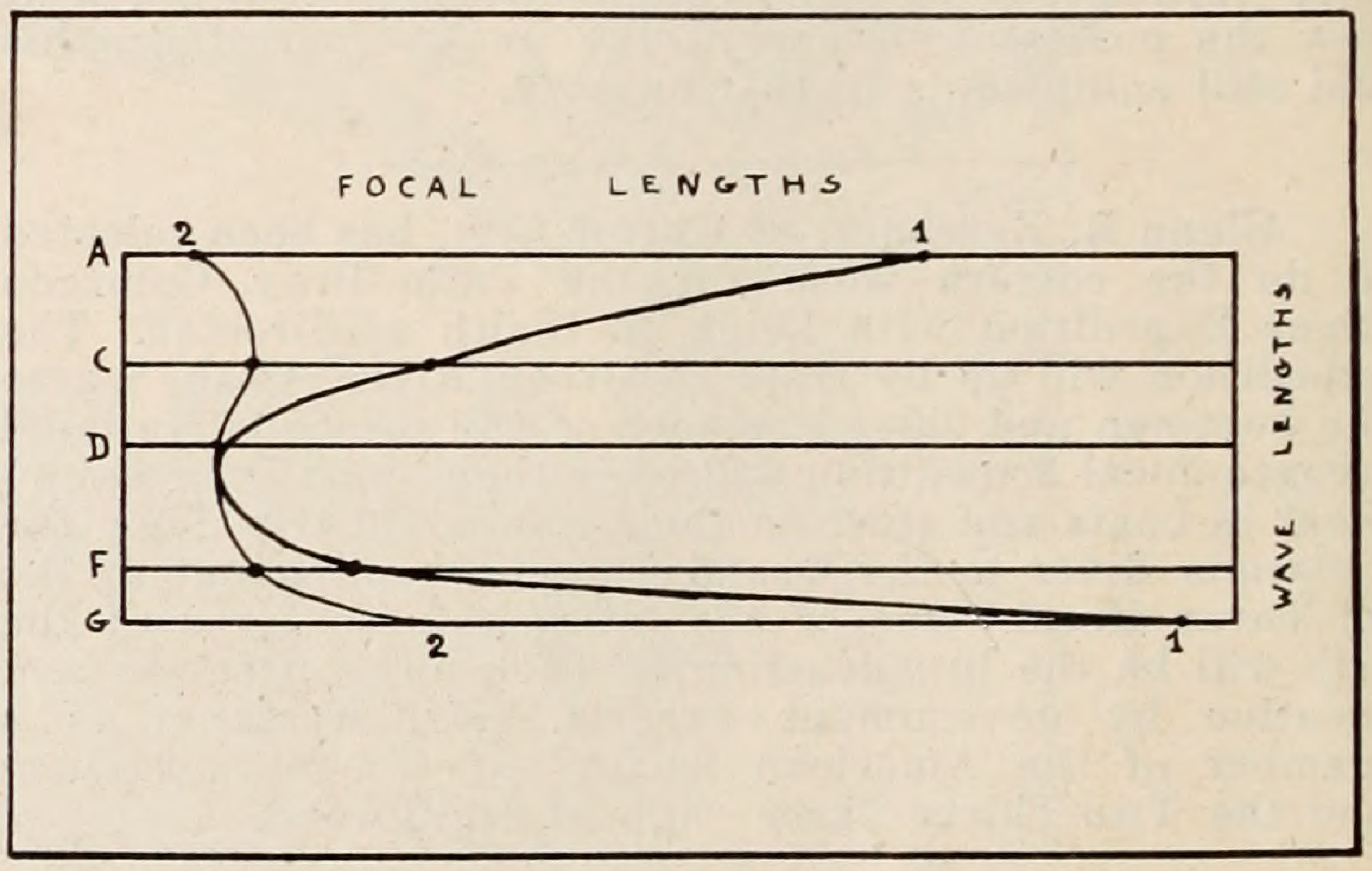
Dr. Hovestadt in his work on "Jena Glass and its scientific and industrial applications," gives graphically a very clear idea of the achromatization of lenses.

In Fig. 30, is shown the variation of focal length for the different rays of the spectrum, in two different combinations of glasses.

No. 1. A Silicate Crown with a Silicate Flint.

No. 2. A Phosphate Crown with a Borate Flint.

The focal lengths of the rays are taken as abscissae, and the wave-length as ordinates.



"On inspecting the curves, it will be seen that the "scattering of foci, is confined within much narrower "limits in the combination 2, than in the combination 1, "and further that the colour union obtained in 2, is triple "instead of double. The curve 1 is cut by any ordinate "in only two points so that chromatic foci will only be "united in pairs. But in curve 2, owing to the double "bend there will be union of three chromatic foci through-"out the whole region extending from near A1 to F, so "that there only remains a slight scattering of the rays "beyond F."

The above, quoting Dr. Hovestadt.

By the accompanying diagram, it is very easy to understand the significance of Secondary and Tertiary spectra

*(Concluded on Page 25)*

# *Must Be A Capitalist*

## Cameramen Forced to Invest Heavily to Practice Their Profession

*By* An A. S. C.

Not only the public, but even most people in the motion picture industry do not realize the investment necessary to be made by the average master cinematographer to successfully follow his profession. Even those employed in the many branches of photographic endeavor, who specialize, and those who have not yet advanced themselves to the master plane of achievement are weighted with more or less personal expense in acquiring necessary equipment.

On account of this forced situation the individual is not as well paid for his efforts as would seem at first thought. The remuneration is little above the level, if any, of that given the master technicians of other branches, such as carpenters, electricians, etc.

There are many cinematographers who have actually invested no less than $3500.00 in their equipment while others are burdened with an investment up to $10,000.00. It is not uncommon to find men who are constantly carrying an investment of $10,000.00.

In the main the producer forces this condition and usually expects the cinematographer to furnish the entire photographic equipment for the purpose of securing a proper negative to register his production before the public and his percentage of profit is greater because the cinematographer has carried the load of investment that was mechanically necessary to secure the negative.

The average salary paid the cinematographer for his services and the use of his equipment is little more than living wage. Figuring rental value, depreciation, repairs and interest on his investment there is little remaining that he can call "net." Only in a comparatively few cases is there sufficient salary paid whereby a fair net profit can be realized and these are usually instances where the individual is well established and recognized for his ability par excellence.

The larger corporations, except in isolated instances, furnish equipment which is of a high order. In such instances any additional equipment the cinematographer may desire to employ in order to obtain an effect that will stamp the finished production with his personality must be obtained at his expense.

The ambitious cinematographer often invests a good percentage of his earnings in experimental work that is highly advantageous to the producer and the artistic quality of a production without realizing any profitable return beyond the personal gratification attendant upon his success.

Except for the producer who finances the production, the cinematographer is the most necessary studio employee, for without photography there could be no production. He can very well be considered the "backbone" of the production, while the financing is the life that stirs the entire thought into action and, in order to portray a high percentage of photographic excellence, the best and most perfect and expensive photo equipment employed by a cinematographer, who has been through an intensive training for his profession, must be available in order to call forth and produce visually the spirit and thought that it is desired to impress upon the audience.

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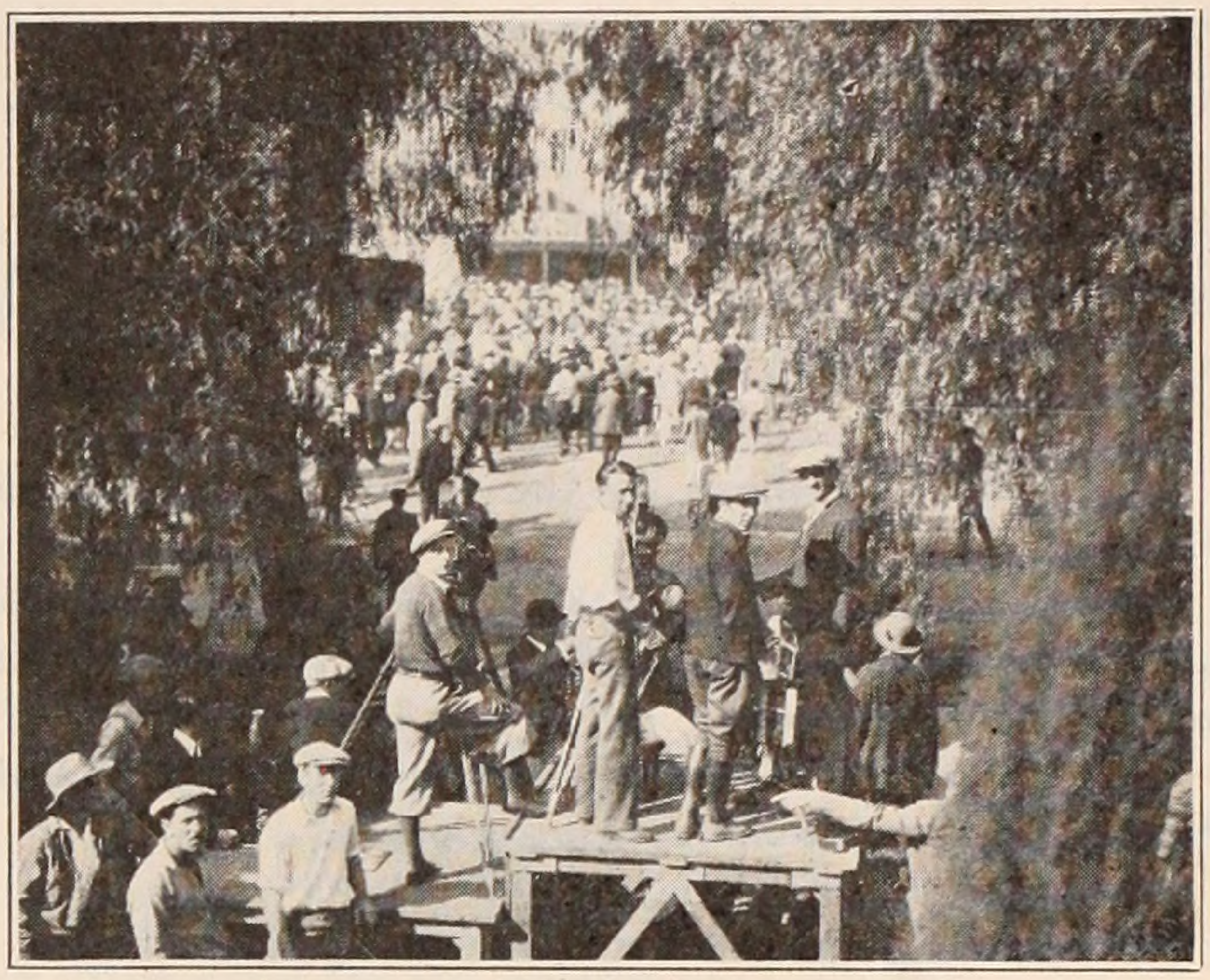
# *Boyle Heads Big Staff*

Charles Boyle, A. S. C., as first and William Wheeler, A. S. C., as second photographer, are heading one of the biggest camera staffs on current production, shooting the Paramount-Christie special of "Tillie's Punctured Romance," which Edward Sutherland is directing. It will go into the unusual class of productions cinematographically on account of the many big shots in the circus atmosphere and also in the parts of the production which go into submarine stuff at sea and scenes in the trenches and Belgian villages.



On account of the numerous chariot races in the circus part of Tillie and some unique war angles which have been developed in the story by Monte Brice, Mr. Boyle will head a staff of twelve cameramen, not counting the assistants. He was recently with Sutherland in "Behind the Front," and "We're in the Navy Now."

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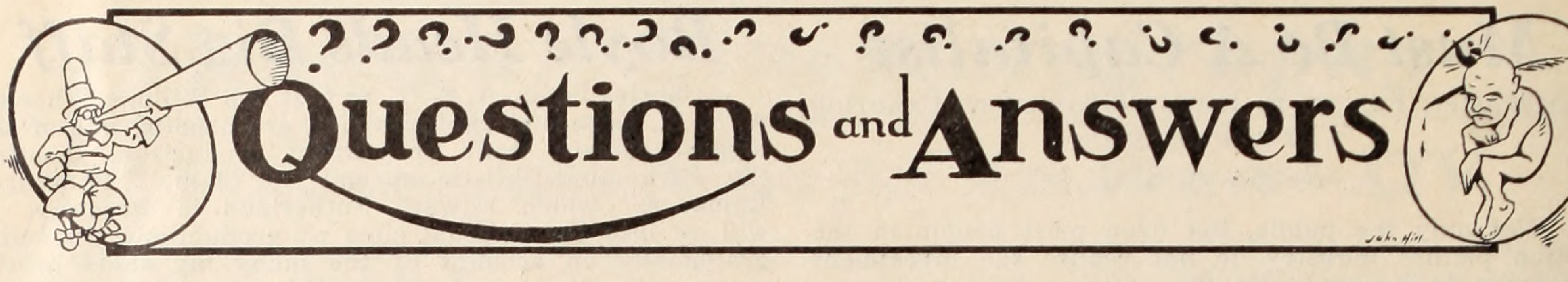

# Questions and Answers

*[The Question and Answer Department of The American Cinematographer is not reserved for professional cinematographers, but is open to anyone who may have any inquiry to make appertaining to cinematography or to photographic subjects in general. The questions are answered by experts and the information published is as near 100 per cent correct as our archives and wide experience yield.*—Editor's Note.]

* * *

QUESTION—What is the meaning of the name "Metol?"

**ANSWER—"Metol" is the trade name of a developer and also a name registered as a trade-mark by the Hauff Company of Germany.**

**The chemical name and composition of Metol is "Methyl-para-amido-metacresol-sulphate"**

$(C^6H^3CH^3NH^2CH^3)^2(H^2SO^4)$

**or "Mono-methyl-para-amido-phenol-sulphate"**

$2C^6H^4(OH)NH^2(CH^3)H_2SO^4$

**which names would be evidently unpopular for marketing purposes.**

**Metol is an extremely rapid developer, giving soft, delicate negative. Mixed with Hydroquinone which is a slow, contrasty developer, and ideal developer for all round commercial work, is obtained.**

* * *

QUESTION—Is there such a thing as an F aperture for projection lenses?

**ANSWER—Of course there is!. The effective aperture of a lens, that is the optical diameter of the lens that limits the amount of rays admitted through it, is always measured in the ratio of the focal length.**

**In camera lenses, the F aperture is variable by means of the diaphragm. In projection lenses, the diaphragm is omitted and the aperture is given by the mount of the lens.**

**The aperture of any lens is determined through the calculations necessary to bring about the correction of the several aberrations pertaining to lenses.**

* * *

QUESTION—What is the address of Mr. F. B. Good, Jackie Coogan's cameraman?

**ANSWER—We are not authorized to give the private addresses of the members of the A. S. C.**

**If you want to communicate with Mr. Good, send your mail to the address of the A. S. C. Twelfth floor, Guaranty Building, Hollywood, and it will be forwarded to Mr. Good.**

* * *

QUESTION—How many motion picture amateur cameras are they that work with standard 35 millimeters film?

**ANSWER—The hand cameras for Standard 35 mm. film are the "Sept," made by Debrie of Paris, the "De Vry," made by the De Vry Co. of Chicago and "Eyemo," made by Bell & Howell of Chicago.**

## *Claim Fool Proof Method Of Developing Negatives*

Complete revolution in methods for developing motion picture negative is promised through the introduction of a machine for the purpose which has been designed and built under Frank E. Garbutt, head of the laboratory department of the Paramount Famous Lasky Corporation,, according to announcement by B. P. Schulberg, associate producer in executive control of the Paramount West Coast Studio. This negative developer or, more accurately, processing machine is declared to solve a problem that has been facing the film industry ever since the first foot of film was immersed in the "soup." Garbutt's device will bring about that absolutely uniform processing which has been the objective of motion picture laboratories since their inception.

Until the present time the processing of motion picture negative has depended on a series of hand manipulations of 200 foot or shorter lengths of film wound on racks and placed in succession in the developing, fixing, washing and other baths. The drying has been accomplished by transferring the film from many racks to large drums which are rotated in a clean atmosphere. Notwithstanding the many detail improvements which have been made in this general method as the industry has grown, it has been subject to many troublesome and more or less inherent difficulties. The cost has been high and the resulting quality of negative has often not been such as to yield the full pictorial value existing in the undeveloped negative. The more common defects of the method are well known to those in the laboratory end of the industry, as well as the ordinary means of minimizing these defects.

The real fundamental fault of this method is that it is dependable upon highly skilled manual manipulation and the personal judgment of operators of long experience, which means that an acceptable degree of perfection has been obtained only by virtue of continuous vigilance and careful inspection.

Moreover, as the industry has progressed in its pursuit of artistic perfection, the requirements have become increasingly stringent and the attainment of satisfactory quality more and more difficult and expensive. Faults which were accepted without criticism even a year ago are not now tolerated in the higher class of pictures, and this new standard of perfection has proven very expensive to maintain by the time-honored methods of hand negative processing.

Three or four years ago Garbutt foresaw the approach of this situation and, after studying the problem from all angles, concluded that the only real solution lay in the reduction of negative processing to a machine operation which would be so perfectly worked out as to practically eliminate the variables of human action and judgment. That this was a difficult problem may perhaps be best realized by a consideration of the fact that a single short length of exposed negative may constitute the only record of a scene which has cost thousands of dollars to take, so that the possibility of damage to such negative by reason of mechanical failure could not be tolerated. To devise a machine which would possess the absolute maximum of reliability combined with the delicate gradations of control necessary to secure all of the quality inherent in the negative, has been no easy task, as may be well appreciated.

Garbutt supplemented his intimate knowledge of the problem by enlisting the services of Leigh M. Griffith, a mechanical engineer formerly with the Government

*(Continued on Page 21)*

# Happy Holidays

*to*

## *the Professional Movie People of the World*

TO YOU who have contributed your efforts to the enjoyment of from **thirty** to **one hundred million** people of the world **daily** through your services to professional motion pictures, GREETINGS, and wishes for the best the holiday season can bring you. Your part, major or minor in a comparative sense, has been equally indispensable to the industry in its attainment of the dominant position it holds today. During the past twenty years you have been associated intimately, in some capacity, with Bell & Howell Cameras.

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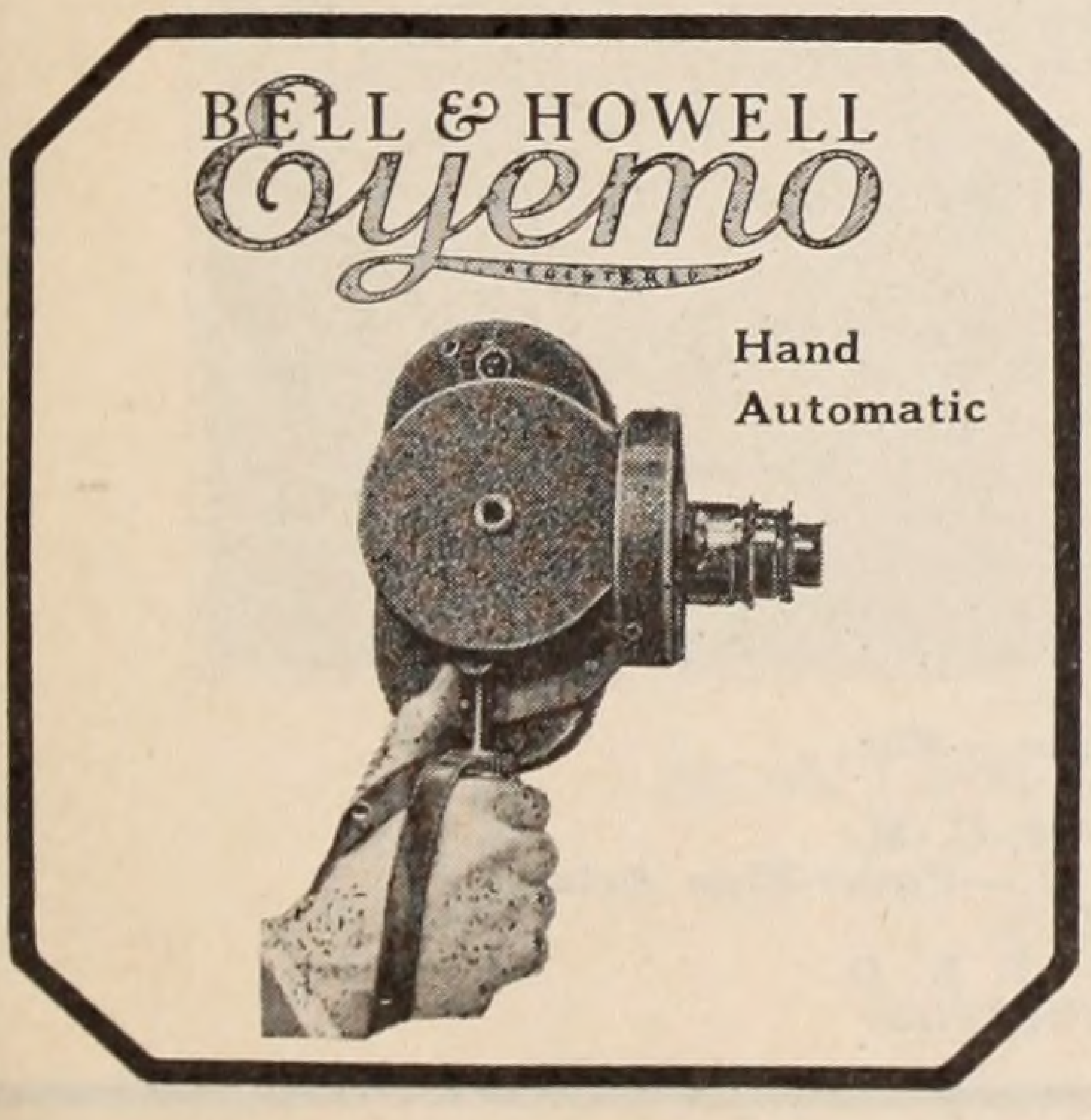

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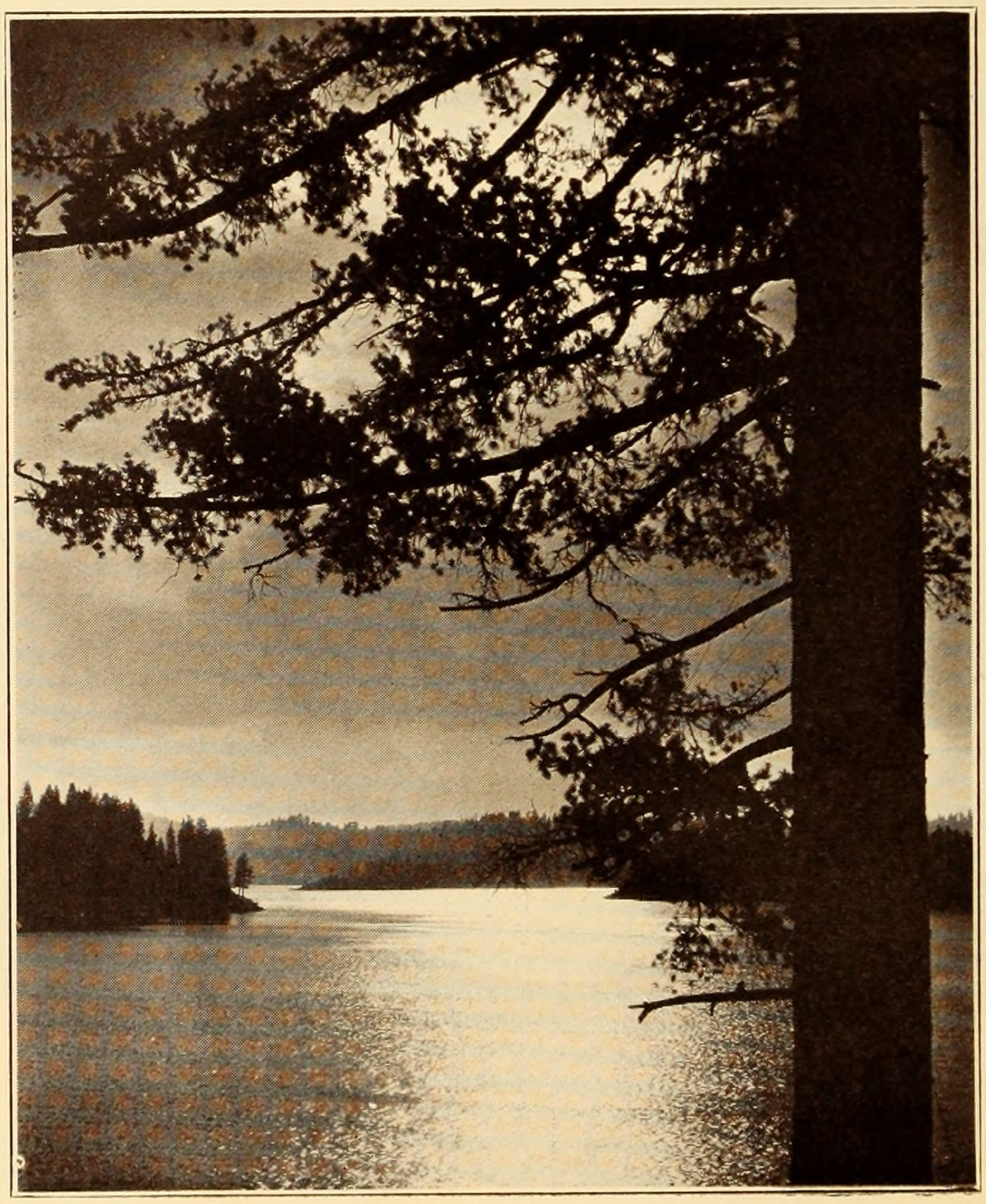
*In the Canadian Rockies—A study of Autumn days by Elmer G. Dyer, A. S. C.*

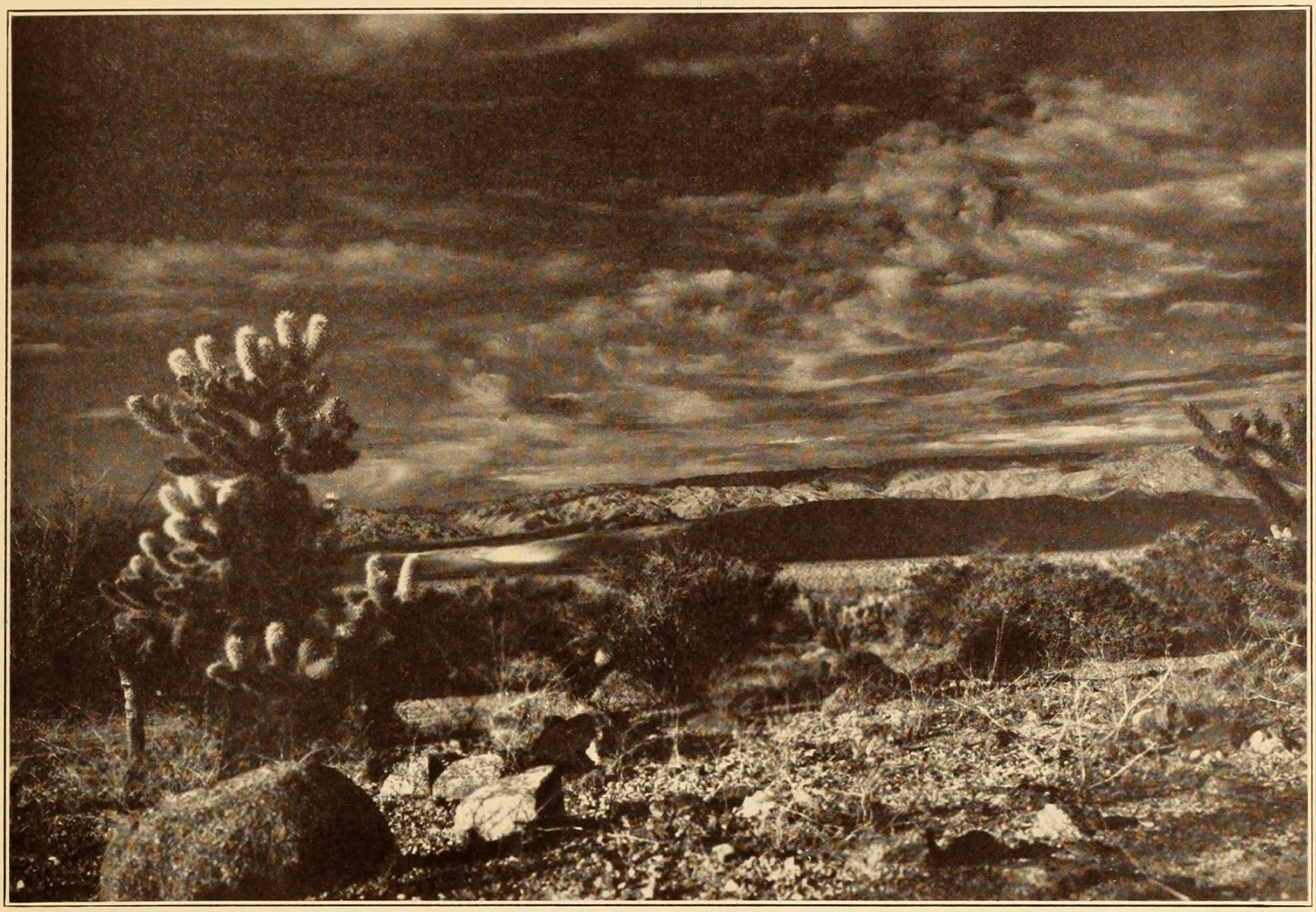


*(Above)*

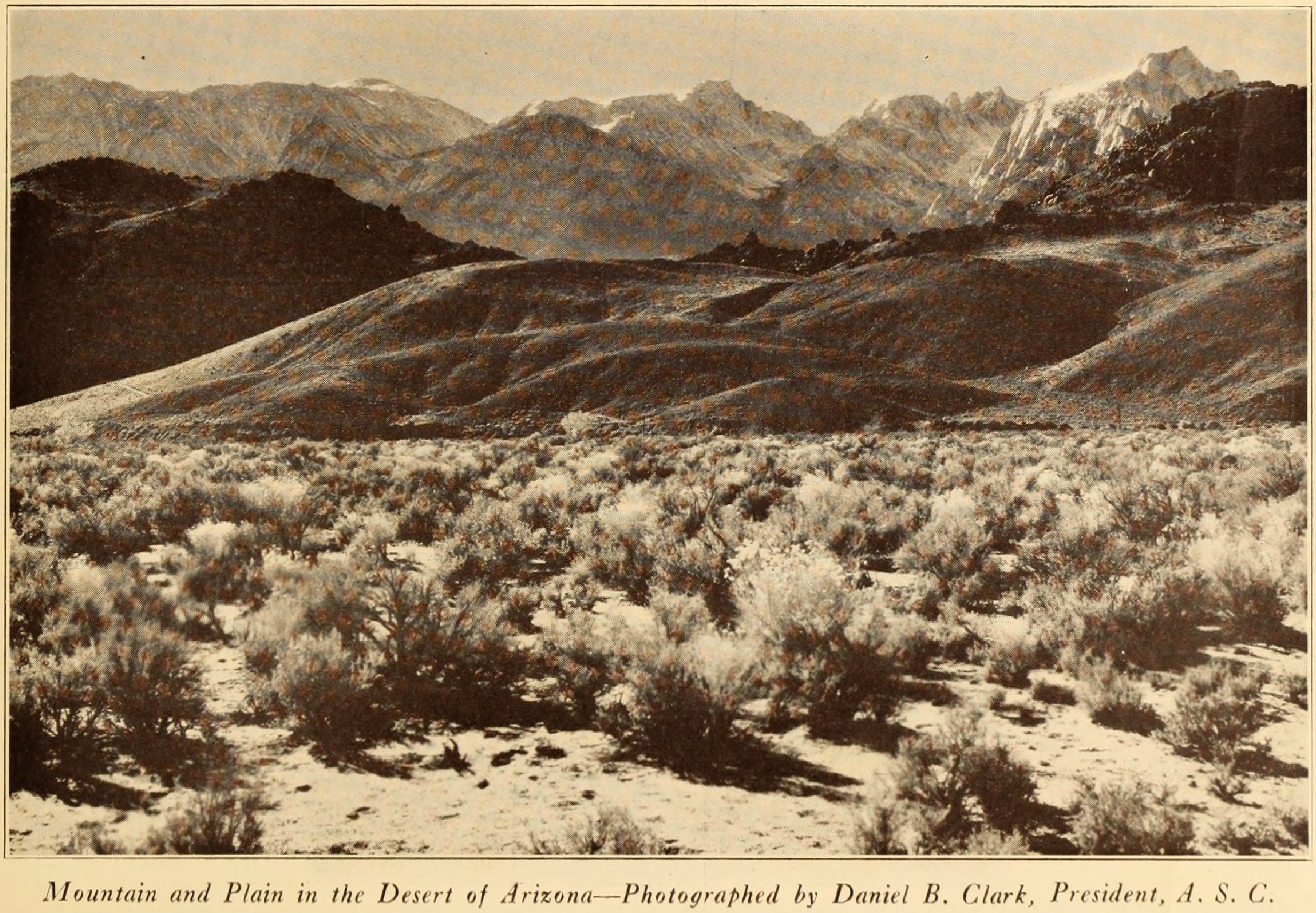
*A Winter scene on the Truckee River, California —Photographed by Elmer Fryer, A. S. C.*

*(At Left)*

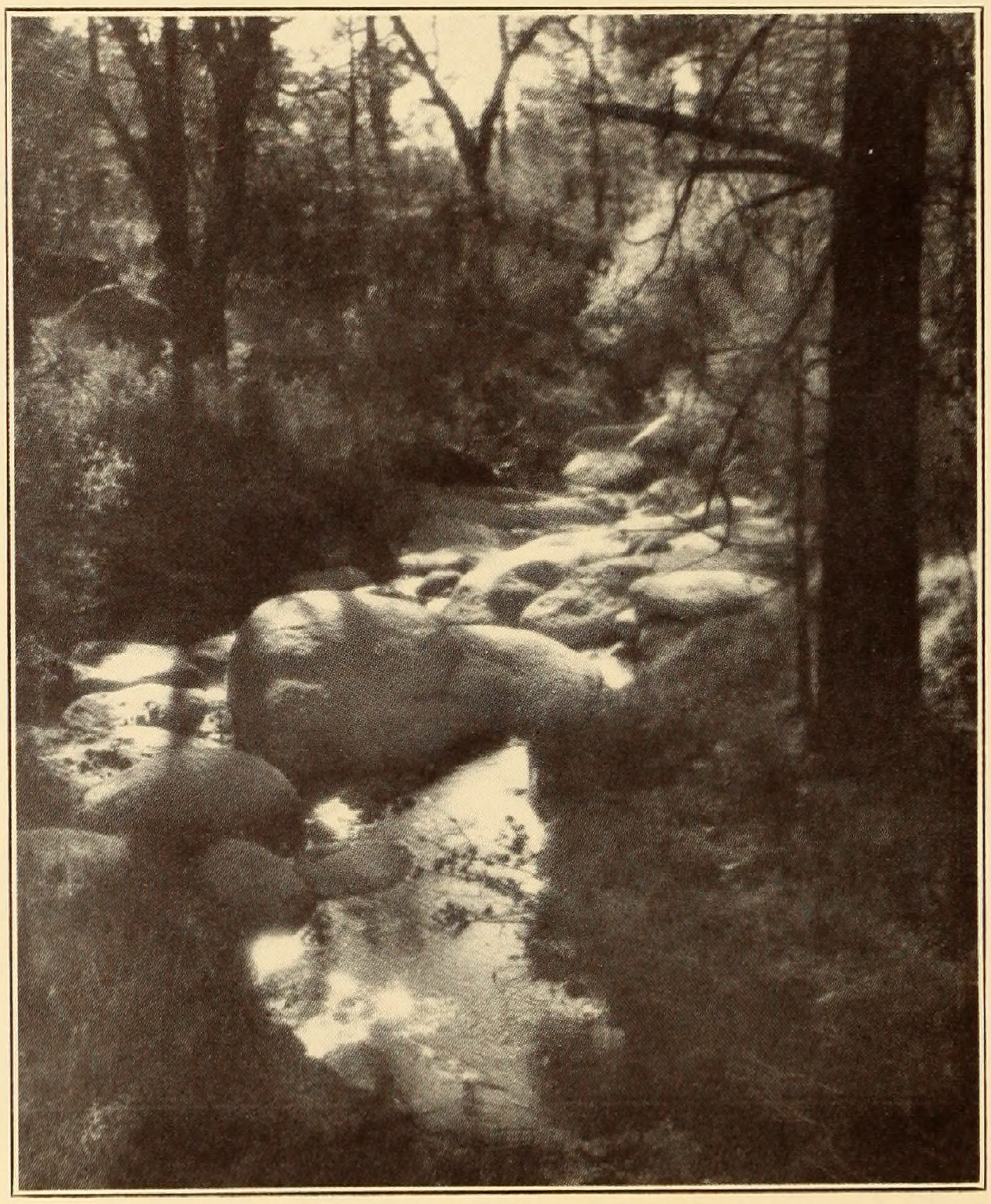
*Big Bear Lake in the Moonlight —Photographed by Elmer Fryer A. S. C.*



*Remarkable Composition of Desert and Cloud in Arizona—Photographed by Daniel B. Clark, President, A. S. C.*



*Mountain and Plain in the Desert of Arizona—Photographed by Daniel B. Clark, President, A. S. C.*



*(Above)*

*A Camera Painting from the Studio of Elmer G. Dyer, A. S. C.*

*The fine screen is caused by the grain of the satin finish paper.*

*(At Left)*

*"When the distant mountain stream reflects a golden glare."*

*By Elmer G. Dyer, A. S. C.*

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Webb, Arthur C.—Attorney.

## SPECIAL PROCESS AND TRICK CINEMATOGRAPHERS

Baker, Friend—
Binger, R. O.—M.-G.-M.
Cully, Russell—Lasky.
Knechtel, Alvin C.—First National.
Emlay, Earl—E.R.L. Studios.
Fulton, J. Phipps—Universal.
Pollock, Gordon B.—Lasky.
Smith, Jack—Fox.
Mammes, Ray—M.-G.-M.
Cohen, Eddie—
Edouart, Farciot—Lasky.
Flora, Rolla—Lasky.
Lipstein, Harold—M.-G.-M.
Roberts, Oren W.—Lasky.
Shearer, Douglas G.—M.-G.-M.
Stull, William—E.R.L. Studios
Smith, Arthur—Lasky.
Smith, Jack—Fox.

## AKELEY CINEMATOGRAPHERS

Bennett, Guy M.—
Blackstone, Cliff—Lasky.
De Vol, Norman—Fox.
Dyer, Elmer G.—Universal.
Fetters, C. Curtis—Fox.
Galezio, Leonard T.—
Greiner, A. Leroy—First National.
Hickson, John T.—
Hoke, Ira B.—
Larabee, Nelson—Warner Bros.
Marshall, Chas. A.—M.-G.-M.
Marzorati, Harold J.—M.-G.-M.
Mason, Harry G.—
Novak, Jos. J.—Universal.
Olsen, R. B.—
Ramsey, Ray Lloyd—Universal.
Rand, William—Lasky.
Roberts, Josiah—M.-G.-M.
Sickner, William—First National.
Stout, Archie J.—Lasky.
Steene, E. Burton—Lasky.

## NEWS CINEMATOGRAPHERS

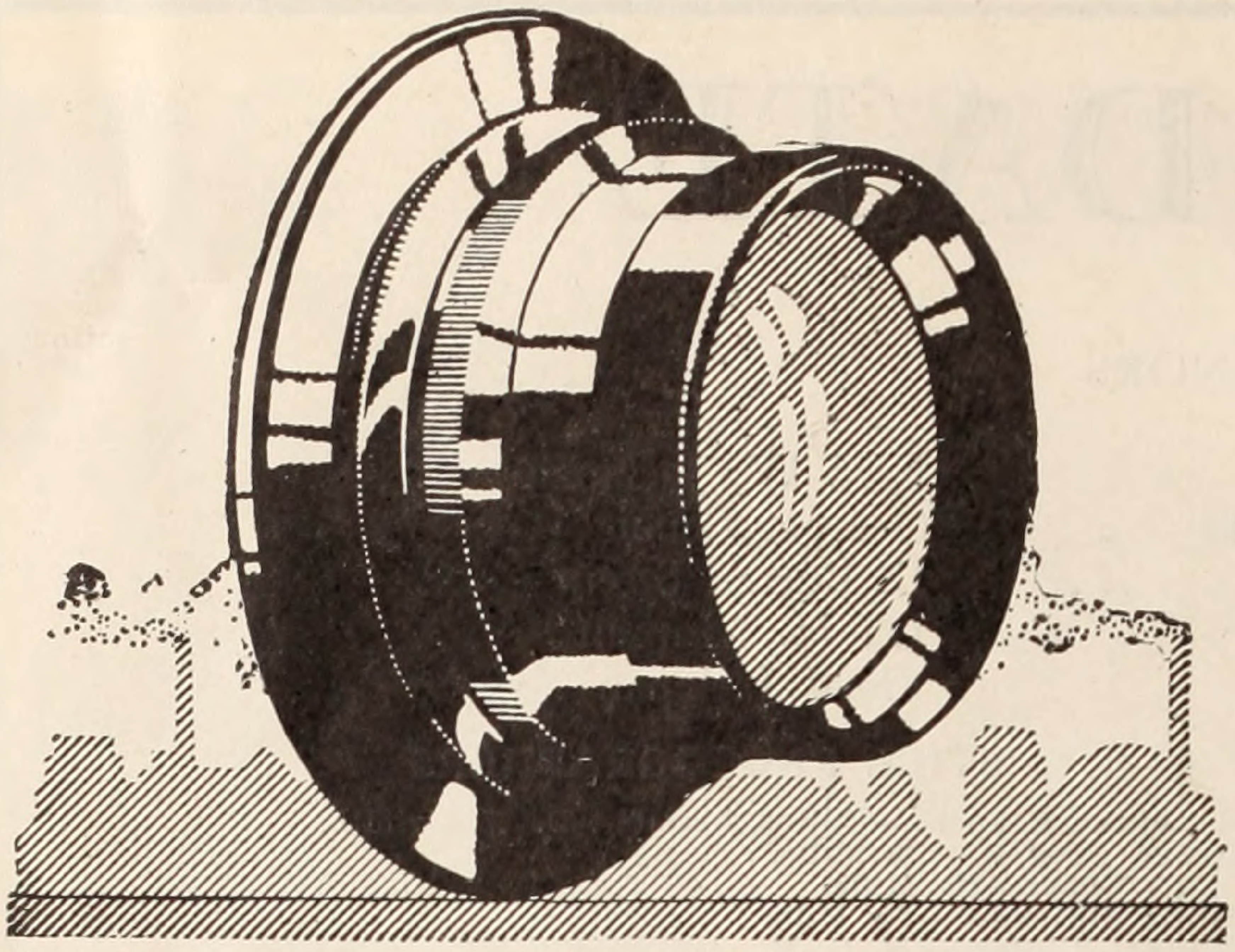
Grimes, William H.—M.-G.-M.
Parrish, Fred—Fox, Colorado Springs.
Staub, Ralph B.—Columbia, Specialties.

## STILL PHOTOGRAPHERS

Alexander, Kenneth—United Artists—D. W. Griffith.
Archer, Fred R.—De Mille.
Fryer, Elmer—De Mille.
Kahle, Alexander—De Mille
Mannatt, Clifford—M.-G.-M.
Parker, Robt. M.—E. R. L. Studios.
Richee, Eugene Robert—Lasky.
Rowley, Les—Lasky.
Sigurdson, Oliver—Metropolitan Studio.
Thomas, Wm. E.—De Mille.
Van Rossem, Walter J.—James Cruse, Inc., Met. Studio.

## SECOND CINEMATOGRAPHERS

Bader, Walter S.—M.-G.-M.
Bauder, Steve L.—M.-G.-M.
Baxter, George—De Mille.
Bennett, Monroe—
Borradaile, O. H.—Lasky.
Chaney, George—United Artists.
Chewning, Wallace D.—M.-G.-M.
Cunliffe, Donald—Universal.
Davis, Leland E.—
Doolittle, Jas. N.—First National.
Drought, Jas B.—Universal.
Dunn, Linwood G.—Metropolitan Studios.
Dyer, Edwin L.—
Fitzgerald, Edward—M.-G.-M.
Giridlian, Jas. N.—F. B. O.
Greene, Al M.—Technical Art.
Greenhalgh, Jack—F. B. O.
Guffy, G. Burnett—De Mille.
Haas, Walter—
Harten, Charles—New York.
Head, Gordon G.—
Hendrickson, Fred S.—Lasky.
Huggins, L. Owens—
Jenkins, John—
Julian, Mac—
Keyes, Donald B.—
Landrigan, John S.—Lasky.
Lang, Charles Bryant—Lasky.
Longet, Gaston—F. B. O.
Lanning, Reggie—Lasky.
La Shelle, Joe—
Laszlo, Ernest—
Lindon, Curly—
Martin, Robt. G.—F. B. O.
Marta, Jack A.—Fox.
Merland, Harry—Lasky.
Mols, Pierre M.—M.-G.-M.
MacLean, Gordon—M.-G.-M.
Nogle, Geo. G.—
Pahle, Ted—
Palmer, Robt—M.-G.-M.
Parsons, Harry—
Pittack, R. W.—Lasky.
Planck, Robt. H.—Columbia.
Prince, Al—Universal.
Pyle, Edwin L.—
Ragin, David—Fox.
Ray, Bernard B.—
Redman, Frank—DeMille.
Reed, Arthur—M.-G.-M.
Rees, Wm. A.—Fine Arts.
Schopp, Herman—Metropolitan Studios.
Shepek, John, Jr.—Educational.
Silver, John—
Smith, Jean C.—De Mille.
Stine, Harold E.—De Mille.
Tappenbeck, Hatto—Fox.
Trezo, Fred—Universal.
Thompson, John—F. O. B.
Unholtz, George—Sennett.
Van Dyke, Herbert—M.-G.-M.
Van Enger, Willard—Warner Bros. Vitaphone.
Wagner, Robt—First National.
Walters, Joseph J.—F. B. O.
Westerberg, Fred—De Mille.
Wilde, Harry—
Williams, Alfred E.—Lasky.
Witzel, E. L.—Universal.



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# It Is In The Box

By Alfred Gosden, A. S. C.

(Continued from Page 8)

many, a motor generator set and a Graham Bros. truck for the transportation of the M-G set.

We landed in Yokohama and after staying a few days in Tokyo, being entertained at Geisha parties, press banquets and so on, we proceeded by train to Kyoto, a night's journey.

The whole of the studio personnel was at Kyoto station to meet us, waving American and Japanese flags, then all were loaded into automobiles, and in what almost was a triumphal procession, with a brass band (?) in the lead, we proceeded to the studio.

Arrived at the studio, after being entertained with the inevitable o cha and sembei (tea and thin biscuits) we were introduced to the stars and departmental heads, photographed by the movie press men and then taken on a tour of inspection.

The studio consisted of one covered stage, another under construction, a number of good dressing rooms, executive offices, and a very fair laboratory, the latter not comparable with any that we have here, but much better than I had been led to expect from the information I had received in the Tokyo office. As a matter of fact, until we arrived in Tokyo, I had not expected to find any established studio at all.

The first thing to which my particular attention was directed was the developing time for negatives; it was **two and a half minutes**; can you credit it? So that being the case my first job was to change it to a twelve-minute developer; I, personally would have preferred a twenty-minute soup, but I hesitated to make too drastic a change at the first jump.

In the drying room there were three drums, each ten feet long by five in diameter, and the film was placed on them in a passable manner, but the method of removing it was far from that. Instead of running the film off into lined bins, as is usually done, they took it off in loops over their arms and carried it in this fashion into another room to a re-wind.

When I drew the attention of the laboratory head, Taumra-san, to the matter, who by the way, spoke and understood quite a bit of English, he remarked: "That all right, that Japanese way." I, having already concluded that a little tact would go a long way towards getting co-operation, said: "Listen, Tamura-san, in days gone by when you wished to go anywhere and it was beyond walking distance, what did you do?" To which he replied "Poor people walk all time, rich man ride horse." "Well," said I, "but now that you have adopted quite a number of foreign customs, especially travelling by train, bicycle and automobile, you no longer walk, but ride in the foreign way, which you must admit is a great advantage, so why not try the foreign way of taking the film off the drums, and I am sure that you will soon find that it will be an advantage to do so."

That won him over. Very soon we had some bins made up, lined with flannel and put into regular use.

The printing machine which they were using is one that is made in Japan, fashioned after the style of the old Moy and Williamson printing machines of about fifteen years ago, nominally a step printer, but as the film was being run through at an approximate speed of one hundred feet a minute, it was more in the nature of a continuous printer, without the latter's advantages, and scratches! It was truly awful, especially on release prints, after several copies had been made, each subsequent run causing a further batch of scratches to accumulate, so imagine what the fifteenth copy or thereabouts looked like on the screen.

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As soon as it was possible we installed the Duplex printing machine, but there was quite a delay in getting it in working order as we were obliged to have a special series of batteries made to supply a steady and reliable current of electricity to the lamps; all "juice" in Japan comes to the consumer at 100v A. C. except for power, but in multiples of 100, not 110 as we have it here.

This matter of voltage also affected the working speed of the Duplex, the motor of which was wound for 110v, consequently slowing it up.

The method of making a light change on the Japanese machine, was to watch the negative in the aperture, then when a change of density in a scene came along, make a more or less correct guess at the light number, and attain it by running a lever around a selector ring. By this system usually about a foot or so ran through before the light change became effective. Imagine the result on the screen.

Having no testing machine, it was up to me to devise something in the way of a substitute; my first step was to have a light box made, with a ground glass front, in the usual fashion, then I tried to obtain a series of pieces of negative graduated in density equal to the printing lights. Being unable to accomplish this, I took a piece of negative, the correct printing light of which I knew to be nine, made prints from this on lights 1, 3, 5, etc., up to 17, then from the positive I made a duplicate negative on light 9, which I placed, cut into nine-inch strips at intervals along the front of my light box, but reversing their order, calling the dense piece on light 17 light 1, and 1 became 17, which gave me a fairly accurate graduate for comparison

The matter of camera exposure was another case that called for considerable attention; they were so uneven, especially when the Japanese cameraman made lap dissolves, or as they called them, "lapovers." It was frequently necessary to make as many as three notches in the course of a lap dissolve, to insure the change from one scene to the succeeding one not being too sudden, but the Japanese boys were anxious and willing to learn and gradually became more or less efficient in getting their exposures correct.

Most of the moving picture producing companies in Japan are located in Kyoto; the reason for this is that most of the pictures turned out are of the period of the Samurai, fighting men who went about the country armed with swords, fighting for various reasons but mostly as far as I could make out, for revenge. In the pictures one man usually kills as many as forty opponents. That this is historically true, I have grave doubts. These pictures are known as "old school" and the locations they require are found in and about Kyoto, it being the ancient capital, possesses a large number of old palaces, temples, shrines and gardens, as well as some remarkable scenery in the vicinity of Arishiyama about eight miles west of Kyoto.

From a foreigner's point of view (in Japan, all are "foreigners" who are not Japanese) going on location is not all beer and skittles. Excepting in the principal towns and places where tourists visit, there are no hotels where accommodations can be obtained that are run on the Occidental plan. When one is unaccustomed to sleeping on the floor, eating boiled rice, raw fish, or pickled radishes whilst sitting on the floor on a thin cushion, it is not quite, may I say, desirable.

As an example, I went on location with a company to a place called Sakomoto, situated on the shores of beautiful Lake Biwa, where there is a wonderful old temple. We started from the studio at about 8:00 a. m., going by "densha" (electric car), to Shijo-o-miya, transferred there to another, crossing the town of Kyoto to another transfer point. For some reason the remainder of the company did not arrive at this point until nearly one o'clock, so it was past two o'clock before we reached Otsu, where we were to change to a local steam train that would eventually land us in Sakomoto. In the "teishaba" (station) there was a news stand, where for 50s (25c) I procured a bar of chocolate, which was to be my sole sustenance from 7:30 a. m. until about 7:30 p. m., but I did not know it then. After waiting for some time I asked the interpreter, Isobe-san, what had happened to the train. He made inquiries and was in-

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formed that the water in the tank had frozen solid; they were trying to thaw it out and hoped to start soon. The temperature must have been considerably below freezing point—just how much I do not know. Outside of a "mise" (store) I have no recollection of seeing a thermometer while I was in Japan.

You probably know what the Toonerville trolley is supposed to be like. Well, this little jerkwater line may not have been quite so bad as that but it was pretty shaky. I would like to say here that most of the railway travelling was very good indeed, the cars were comfortable, steam-heated, and all were furnished with the usual conveniences; high speed was not attempted but they were certainly punctual, under normal conditions.

To continue my location experience, as we were jolting along it commenced to snow, and by the time we reached our destination it had reached the proportions of a small blizzard.

Arriving at the hotel, after walking nearly two miles in the face of the storm, the first thing one had to do was to remove one's shoes while seated on the door step, then with feet wet and cold, we proceeded across several rooms or halls, some highly polished, others covered with the national mats, all shiny and cold, to a large room that had glass shoji (sliding doors) on three sides, and a temperature approximating that of an ice house.

Zabutons (cushions about an inch thick) were handed around by the maids, and the whole company seated, or rather squatted themselves in a large circle around the room, patiently waiting for something to turn up.

The only heating apparati were the ubiquitous hebachi. The hebachi is a metal or earthenware jar, varying in size from six inches to two feet in diameter and proportionately high; these are filled about two-thirds full with ashes or sand, which serves as a bed for a charcoal fire about the size of one's fist, sometimes a little larger.

The native method of getting warm is to hold the wrists over the glowing coals, with the idea, so far as I could make out, that the blood thus warmed gradually circulated through the system until the whole body is warmed, possibly I should say de-chilled, if I may coin the term, for they certainly cannot become really heated. Having had nothing to eat except the chocolate since breakfast at seven-thirty, a. m., it now being about 7:00 p. m., naturally the question was "When do we eat?" This was answered in due course by a large tub of hot boiled rice and a plentiful supply of Japanese tea being placed in the center of the room, from which everybody helped themselves. I inquired of my interpreter Isobe-san, if it was possible for me to get some "foreign" food. He informed me that they had sent to a little restaurant in the town, two miles away, that catered to the tourists in the season, and they were going to send something up for me. When the something arrived, it proved to be a very small steak and some French fried (?) potatoes, not much colder than ice. I had almost given up the idea of trying to eat this cold collation, when it occurred to me that it might be possible to warm it a little by piling some of the hot rice on it, but the reverse happened—the hot rice went cold. So after a day of fasting, my meal consisted of warm boiled rice, straight, and Japanese tea.

When the company had eaten and made up, we went out to the location, the electricians having hooked up to the high line in the afternoon, where we shot until 4:00 a. m.

My interpreter told me that if I would like a hot bath, I could get one. The Japanese bath room has as a rule just the one tub, a good-sized one sunk to floor level, with the fire under the tub. The modus operandi is to pour hot water, and it is HOT, over oneself, then soap all over, scrub, and after thoroughly rinsing, jump into the tub and soak. From where I was sitting I could see the bath room door, I counted fifteen people, I think was the number, going into the bathroom which decided me that I would continue to be cold, dirty and exclusive.

No breakfast being available, and having got them off to a good start, I decided to return to Kyoto, where going into the Kikusui Restaurant (foreign) I soon got

# Labor Turnover in Studios

### President Clark of A. S. C. Sees a Way to Prevent Great Waste

"While the motion picture economists are delving into cost sheets, organization, operation, maintenance, transportation, production, materials, overhead, etc., I would respectfully call their serious attention to the consideration of the overturn of labor in the studios as one of the greatest sources of waste if not indeed, the greatest."

So said Daniel B. Clark, President of the A. S. C., in an interview the other day with an eastern fiscal representative of a well known production company.

"The matter of personnel or labor turn-over," continued Mr. Clark, "is, it seems to me, of vital importance in our industry which from its very earliest days seems to have been in a state of flux.

"The personnel of units, studios and even administrative offices seems never to be permanent, so that even the greatest executive is not sure of a long tenure of office and the lesser operatives, down to the humblest understrapper, has not known very far ahead just where he was "at."

"This condition of uncertainty of employment has made for unrest and unrest has in turn bred inefficiency and laxness in work.

"Of course, I am cognizant of the fact that, because of the peculiar nature of our industry, it is impossible to maintain a hard and fast organization, especially in so far as the actor element is concerned, for the public demands variety, but in the case of technical operatives and executives and certain other employees it would seem to be only common sense for a producer to desire to build and maintain an organization as nearly permanent in its personality as possible.

"Such an organization should be notable for efficiency, through loyalty, harmony, spirit of co-operation, contentment and esprit de corps. This is obvious.

"Some economists have gone deeply into this subject, among them Professor Mangus Alexander, of Harvard University. This student of the economics of industrial organization, after investigation of many cases, has arrived at the conclusion that it costs an average of $72.00 to replace an ordinary employee of the grade of laborer; upwards of $500.00 to replace skilled labor and as high as $10,000 to replace an important executive. Applied to motion pictures, these figures would be astounding. They are amazing as they stand to any one new to this subject.

"In treating of this subject in his fine work, "Principles of Industrial Organization, Dexter S. Kimball, A. B., M. E., says:

*(Concluded on Page 24)*

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three orders of ham and eggs, toast and coffee inside me and forgave everybody.

If we had had three Akeley cameras, we could have used them all, on account of the fact that they were a great adjunct to the making of the "Old School" pictures with their running fights and sword play. The Eyemo is also by now a standard requisite in the making of motion pictures in the flowery kingdom, at least I am presuming so, if the Japanese directors and cameramen there are as insistent in their demands for it as they were when we left there. It is a creditable fact that once the advantages of any innovation has been demonstrated to them to their satisfaction, they are real enthusiasts, frequently too much so. They are prone to overdo it and work a good thing to death.

During the six months that we were in Japan we supervised the making of between fifty and sixty pictures, ranging from six to twelve reels each.

There are three thousand moving picture theaters in Japan, seventeen showing straight foreign pictures, about thirty mixed foreign and domestic, and the remainder show Japanese entirely.

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# Projection

[*Abstracts from transactions of the S. M. P. E. read at the Lake Placid Convention*—EDITOR'S NOTE.]

### Why Expert Knowledge and High Class Intelligence are Essential in the Theater Projection Room

*By* F. H. RICHARDSON

*Abstract*

Experience and intelligence are certainly needed in the projection room. Lack of those attributes by the projectionist means loss and their presence in the projection room makes for improved results upon the theater screen, greater economy of operation and increased box office receipts.

If projection practice as it now exists in most theaters is subjected to close scrutiny, its many faults are manifest. Imperfections in motion picture projection operate to lower the amusement and dramatic value of any projection, whereas perfect projection brings out the very best value contained in the production the films carry. However, no amount of expert knowledge upon the part of the projectionist will avail unless it be accomplished by sufficient energy, ambition and pride in the work to cause him to apply that expert knowledge in the best way.

The expense chargeable to unnecessary deterioration of projection equipment due to lack of expert knowledge upon the part of the projectionist is appaling. Lack of expert knowledge makes itself apparent in everything having to do with the results upon the theater screen as viewed by the theater audience, except of course, faults inherent in the films themselves.

* * * * * *

### An Improved Type of Condenser System for Motion Picture Projection

*By* M. L. TOWNSEND

*Abstract*

When motion picture projectors were first built, the optical parts used were, for the most part, such as were already in use for other purposes and for this reason easily obtained. Many of these were ill suited for this new use but would be made to serve in some fashion. An example of this is the condenser lens which collects light radiated from the light source and converges it into the film whence it is imaged onto the screen. A comparatively small lens chosen years ago was adopted as standard.

Since the advent of the very large present day theaters, the motion picture industry has been faced with the very serious problem of finding a way of getting more light to the very large screens. A number of improvements in arc lamps have effected greater efficiency in illumination. Recently a condenser of large diameter has been developed. This lens collects light from the arc within a much greater angle than previously and so uses much more of the light now available.

* * * * * *

### A Few Practical Needs in the Field of Projection

*By* ARTHUR GRAY

*Abstract*

The interest of the theater-going public in motion pictures, today, extends considerably beyond the star, the cast, and the story which the picture tells. They have been educated to expect good photography, good music and better projection.

Astute theater exhibitors find that high grade projection is good showmanship, and some have used this as an effective advertising feature, and business getter.

An increasing number of exhibitors have come to realize the fact that a scratched, dirty film seriously impairs the entertainment value of the picture, and are insisting upon receiving better conditioned film from the film distributing exchanges.

The general condition of the average circulating print, ability to pass without mishap through a projector, is undoubtedly gradually improving, but need for further improvement continues to exist.

A normal amount of wear and tear on the film is inevitable during the process of projection, but a large

## *Claim Fool Proof Method Of Developing Negatives*

*(Continued from Page 12)*

but now Development Engineer at the Paramount Laboratory. Working with Thomas Ingman, Operations Engineer, a machine has been devised which promises to mark the beginning of a new era in the processing of negative. In line with the general effort of the industry, this new machine and method will reduce the cost of production. But of far greater importance is the fact that it will make possible the realization of that uniform high pictorial quality and freedom from minor defects which has long been the dream and objective of the progressive thinkers in the industry.

Owing to the high value of the undeveloped negative it was necessary to provide a mechanism of great delicacy and definiteness of control in order to insure against the possibility of mechanical damage to the film while in the machine. This has been accomplished by an entirely new and extremely elastic form of drive, so designed that the film is under very gentle but definite control at all points in its passage through the machine.

The undeveloped negative is first passed through a speed control mechanism which is adjustable to the exact speed required to give the proper time of development, from which it passes in succession through the developing bath, developer rinse, fixing bath, hypo-rinse, cascade washing bath and drying cabinet, the completely processed negative being delivered on reels at the discharge end. The entire operation of the machine is automatic, the film not being touched by hands at any point in its passage. Each operation is conducted under ideal conditions, the film moving smoothly and uniformly through the several baths and the dryer. As it passes from each bath, the film is freed of adhering liquid by a squeegee, so that progressive contamination of solutions is avoided. The developing and fixing solutions are continuously circulated through tanks in a separate chemical room, where their analysis and temperature are kept to rigid standards. The wash water is carefully treated and filtered. The drying air is washed and heated to the temperature and humidity best suited to give the proper condition to the finished negative, and is circulated through the drying cabinet sections in series.

As it is essential that the negative be not stopped during its passage through the developer, intermediate storage mechanism is provided at several points in the machine so that in the rare event of a breakage or other interruption to the film its movement through the developer may continue uninterrupted, while the film in the vicinity of the defect may be stopped and a repair or adjustment made. There is thus no loss of negative through over-development.

(END)

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amount of the damage which a film often incurs is unnecessary, and is caused by careless handling either during inspection at the exchange, during shipment, or in the projection room at the theater.

Loose splices which separate while the film is being projected, and thereby cause an interruption in the show, continue to be one of the toughest problems with which a projectionist must contend.

The fewer spilces there are in a print, the less probability there will be for mishaps of this nature. Any planning which will result in the number of splices being kept at the very minimum is desirable and very important.

The recent circulation of a considerable amount of buckled film, which results in an oscilating, in-and-out-of-focus effect in the picture when the film is projected, is giving widespread trouble. Various causes have been asribed as being rescponsible for this ondition, and attempts are undoubtedly being made to abate the trouble.

It seems to be a rather complex problem, and must receive the cooperative efforts of technical workers in several different fields of the industry if it is to be quickly and effectively remedied. That the trouble be remedied as soon as possible is imperative.

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# *Panchromatic Film*

By Louis W. Physioc

(Continued from Page 7)

blue and violet rays in order to avail ourselves of those others that we desire; we, therefore, neutralize the highly actinic rays by filters, or mediums of complementary values. Despite the aid of the filters, however, we meet other attendant difficulties, for while they take care of some of the desired rays others must suffer to some degree and our experience teaches us that the selection of the proper tint and intensity of the various filters, together with the proper exposure are matters of very refined judgment; so that we cannot overlook the importance of the knowledge of color.

The physicist teaches us that:

1. White light is composed of mixture of RED, BLUE and GREEN light.
2. RED and GREEN give YELLOW.
3. RED and BLUE give MAGENTA (purple).

It is very evident, then, that panchromatic correction depends upon the selection of a filter nearly complementary to the color we desire to enhance. These complements are found as mixtures of any two elements against the other and we can aid ourselves in finding these by equations and charts as offered below.

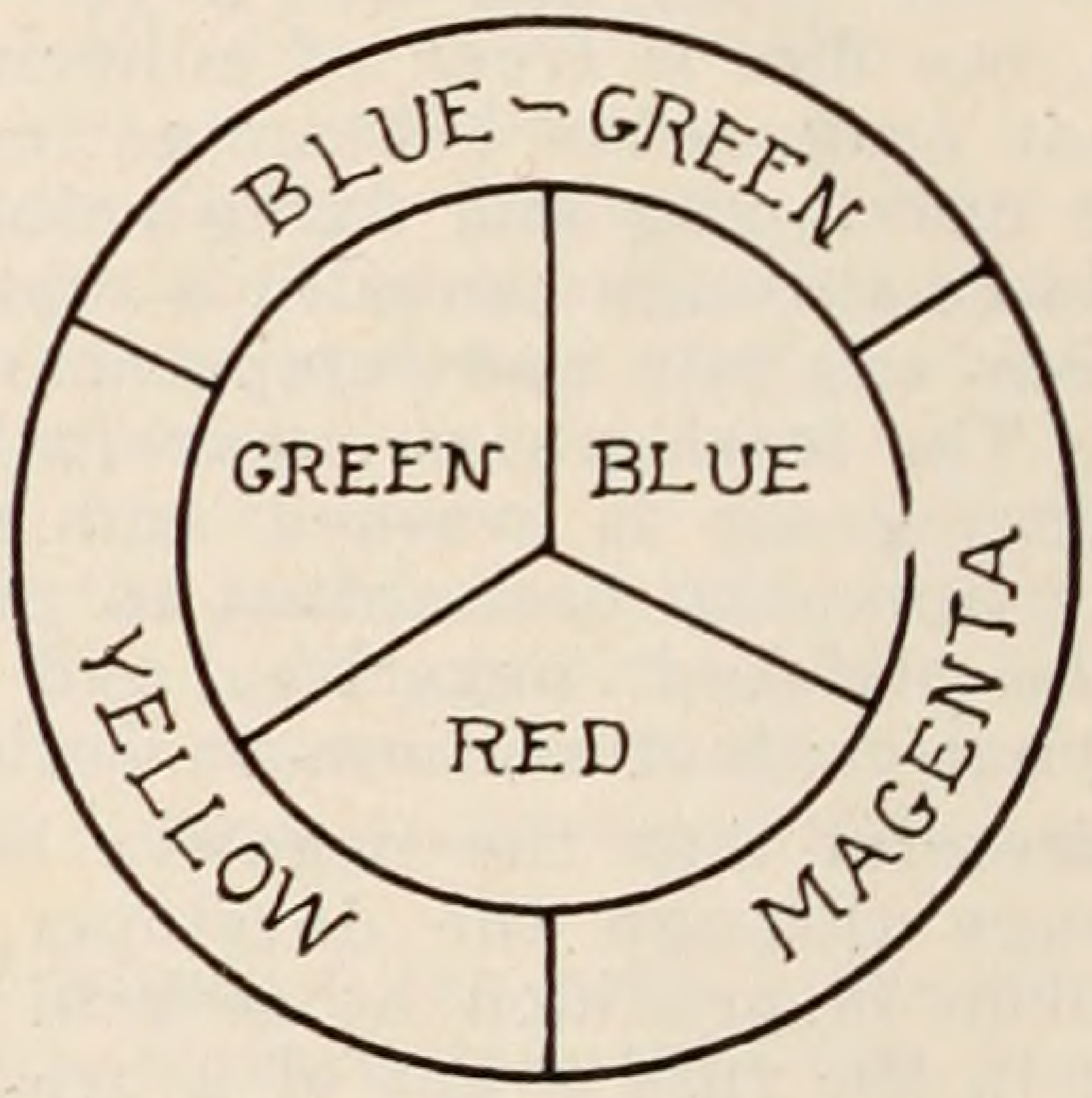
RED+BLUE+GREEN=WHITE LIGHT.

RED=W.L.—BLUE+GREEN (blue-green) Complementary to RED.

BLUE=W.L.—RED+GREEN (Yellow) Complementary to BLUE.

GREEN=W.L.—RED+BLUE (Magenta) Complementary to GREEN.

Or charting it we have:



Taking the centre of the above chart, we have the three elements, Green, Blue and Red, and in the outer circle, we find the secondary combinations. For example, we select green and directly opposite, in the outer circle, we find magenta, the complement of green; choosing next, blue, we find opposite, yellow, its complement and likewise opposite red we find its complement blue-green. We may further enlarge the circle and produce the tertiary tints and in like manner find the complements.

To illustrate the application of the above chart, let us assume that we have a subject in which we wish to suppress a broad area of sky and maintain certain cloud effects; we consult our chart and opposite the blue we find that the proper filter lies within the yellow region. This fact is proven by the general use of so-called K filters, made in varying strengths, K1, K2, K3, etc.

As certain colors can be suppressed so can others be enhanced. We observe this in the fact that some colors can be made to appear more brilliant by juxtaposition to others. This effect is called complementary harmony. The arrangement of colors of approximate wave length is termed analogous harmony.

The use of analogous filters with panchromatic film is quite different, however, from the arrangement of pigments, and can be illustrated by a very simple experiment. Place a two cent postage stamp upon a white piece of paper and view it through a filter of the same color as the stamp and the stamp will be barely visible. Or, which is more convenient, take an Eastman paper carton into the dark room and view it under the ruby light and you will be unable to read the red label. The explanation of this is that the analogous filter provides for a maximum transmission of the rays from the stamp and the full absorption of the blue-green in combination with the white of the paper, allowing only the red to pass, bringing it to the same value as the stamp. These simple experiments suggest, then, that in the consideration of color, there is a double process continually going on, that of absorption and reflection among pigments and addition and subtraction in light.

Now suppose we wished to photograph this stamp on the white paper, it may be readily seen that if we select this red filter in conjunction with panchromatic film, which is so sensitive to red, we would not get much of a picture of the stamp. We may satisfy ourselves by further calculations.

**Using Red Filter**

$$\begin{array}{l} \text{Subject} \\ \text{White Paper} \\ \\ \text{Red Stamp} \end{array} \left\{ \begin{array}{l} B+G—B\ G \ \text{(Absorbed by Filter)} \\ + \\ R \\ + \\ R + R \ \text{(Transmitted by Filter)} \end{array} \right\} = \left\{ \begin{array}{l} R \\ \text{(Reflected by paper and transmitted by Filter} \\ \\ R \ \text{(Stamp)} + R \ \text{(Filter} \end{array} \right\} = R_3$$

**Using Yellow (RG) Filter**

$$\begin{array}{l} \text{White Paper} \\ \\ \text{Red Stamp} \end{array} \left\{ \begin{array}{l} B — B \ \text{(Absorbed by Filter)} \\ + \\ R+G \\ + \\ R + \text{Yellow } (R+G) \ \text{(Transmitted by Filter)} \end{array} \right\} = \left\{ \begin{array}{l} \text{Yellow (RG) Reflected and passed by Filter} \\ \\ \text{Orange } (G+R_2) \ \text{(Transmitted by Filter)} \end{array} \right\} G_2+R_3$$

**Using Blue (Blue-Green) Filter Complementary to Red**

$$\begin{array}{l} \text{White Paper} \\ \\ \text{Red Stamp} \end{array} \left\{ \begin{array}{l} B+G \ \text{Filter} \\ + \\ R—R \ \text{(Absorbed by Filter)} \end{array} \right\} = \left\{ \begin{array}{l} \text{Blue Green (Refelcted by Paper and passed by Filter} \\ \\ —=R+B+G \ \text{(Black Stamp)} \ \text{(Totally Absorbed)} \end{array} \right\} B+G$$

Various filter combinations can be worked out and balanced in a similar manner.

In offering a practical illustration of the use of analogous filters, let us imagine, as our subject, a foreground group of redish, orange rocks against the shadow side of the mountains in the middle distance and background composed of hazy blues and lavenders, gray-greens, etc. To the eye, the rocks in the foreground furnish a wonderful contrast in color, drawing and light and shade, yet our experience tells us that, with the ordinary photographic process, these rocks, because of their color, will be rendered as dark as the shadows of the middle ground and may go even darker than the shadows of the foreground, despite their appearance to

*(Concluded on Page 24)*

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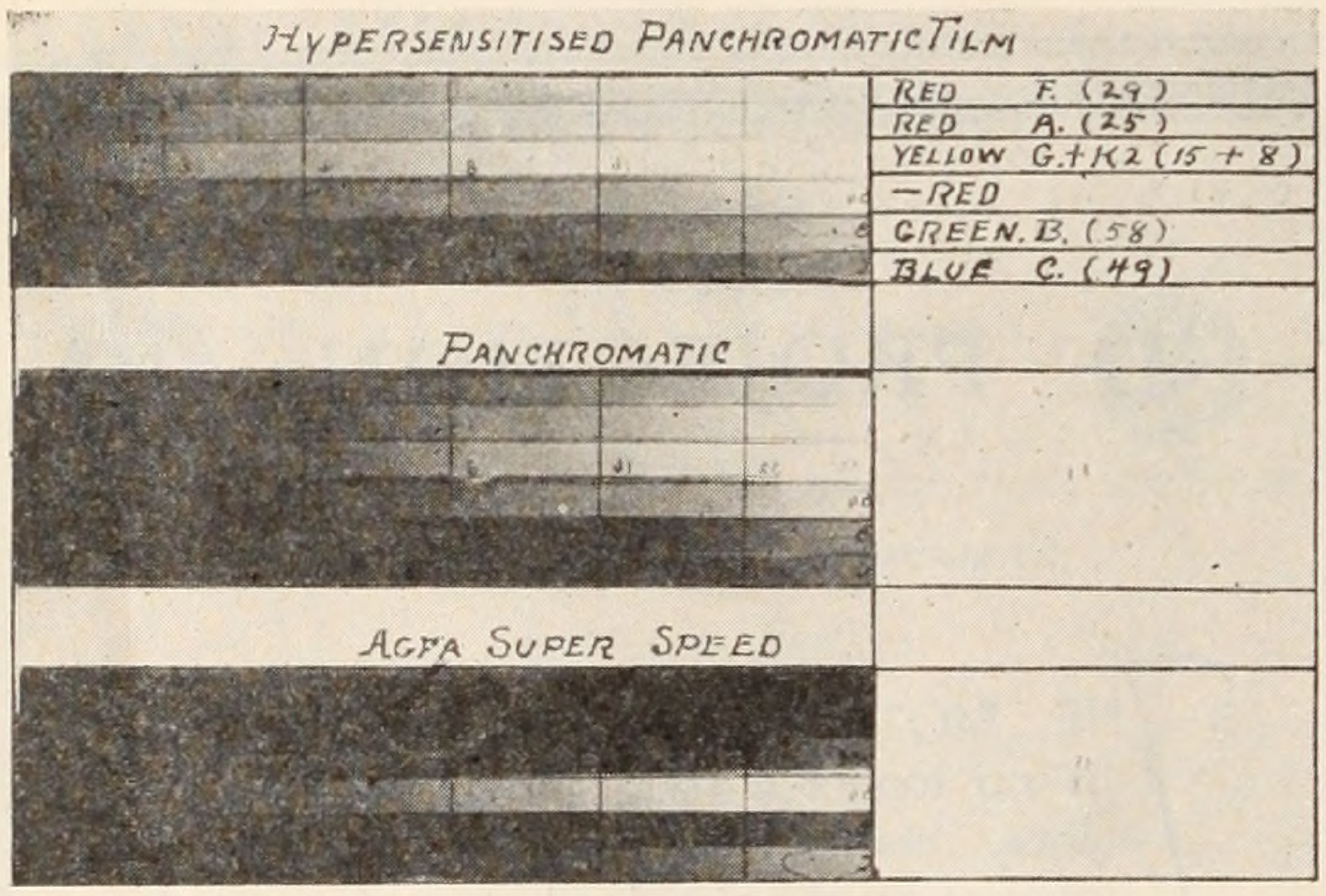
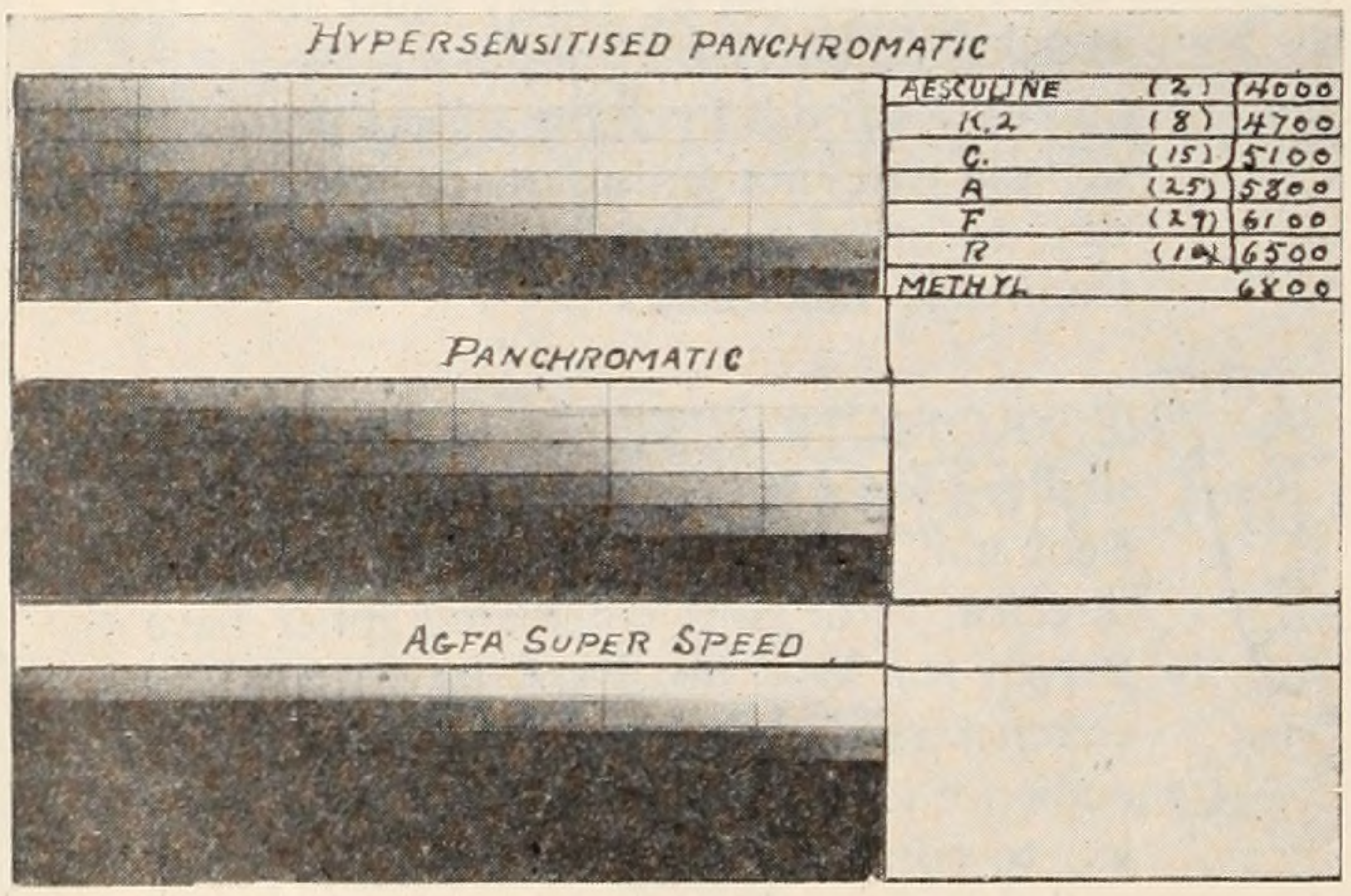
the eye. It is easy to understand, then, that this would produce a flat picture, destroying the contrast of light and shade, color values as well as the beauty of the composition. We, therefore, select an analogous filter, knowing that it will perform the double function of allowing the color of the rocks to pass to the film and of absorbing much of the blues and lavenders of the distance, they being complementary to the filter, thereby raising the key of the rocks in the foreground by the process of analogy.

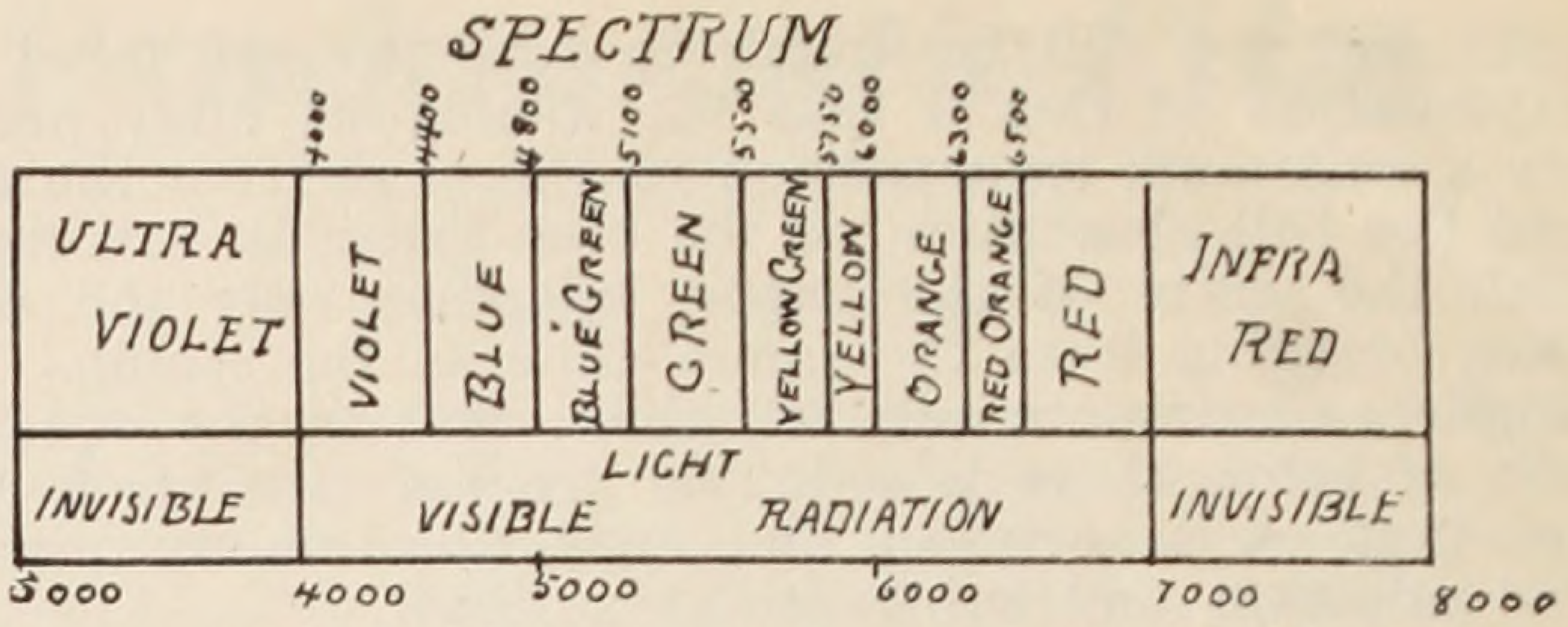
Now, stripping our subject of all technicalities, for the busy one who wishes to "read as he runs," we may deduce from the whole, a few simple facts:

1. That the full value of panchromatic emulsion depends on the proper use of filters.
2. But that in the use of filters of primary colors, values, in the subject, that are complementary to these filters must be sacrificed to a great degree.
3. That these primary filters should only be used where extreme effects are needed, as cited in particular applications, i. e., night skies, etc.
4. That for a general balance of values the yellow, (which is, theoretically, the mixture of the two primaries, red and green), in varying degrees of transparency, is most desirable; and absolute safety is found in the Aesculine (No. 2), Aero (No. 1) and the K2.
5. That, in lieu of filters, quality of light is the next important element.
6. That this light is found in early morning and late afternoon on exteriors, and on interiors, the best results, at the present time, is furnished by the tungsten incandescent.

In support of this last item we offer a series of tests made by Mr. Edward Gheller, A. S. C. These charts need no explanation, except that they were made on three different stocks with two sets of screens, composed of pure colors approaching, as nearly as possible, the filters in common use. The colors are graduated, from right to left, by a squared ratio, to test the scope of the panchromatic emulsion in rendering hues of varying degrees of brilliance.







In conclusion, let us ever keep in mind a few of the errors most common to the use of panchromatic film.

Do not photograph a blue eyed blond with the cold light of the Cooper-Hewitts, or Blue mediums over arcs; the eyes will go white and the hair dark. In fact Cooper-Hewitt lights are valueless with panchromatic emulsion.

Do not make a beautiful blue sky look too black, by over correction, unless, of course, it is intended for a night effect.

Remember that filters greatly reduce exposures and that it is easier to under expose than over expose panchromatic film, therefore, freely illuminate the shadows.

Do not cut out all the hazy, atmospheric effects by over correction; "distance lends enchantment."

If softness is desired, by the use of the full opening of the lens, shutter compensation may be calculated by the following formula:

Normal Shutter (170): Normal Stop: Desired Shutter: Open Lens.

# Labor Turnover in Studios

*(Continued from Page 19)*

" 'One of the most marked results of these changed conditions (from the old days when employees worked a lifetime in a factory) is the shifting character of the personnel in many factories. This difficulty has long been known to factory managers but the study of its economic aspect is comparatively new. Mr. Mangus Alexander has made a most interesting and important investigation of this matter. His report covers the experience of twelve factories which gave employment to 37,274 employees at the beginning of the year 1912 and 43,871 at the end of that year. The net increase for the year was therefore 6697 but during that period 42,571 people were hired and, as a consequence, 35,874 must have been dropped from the employment rolls during that same period. The factories examined were fairly representative in character and size, the range of work covering large steam engines, electrical apparatus, automobiles, and fine tools and instruments. The smallest factory employed 300 people and the largest had more than 10,000 employees on its payroll. In these twelve factories it was found that about 73 percent. of the employees engaged during the year had not worked in these factories before, while about 27 percent. had worked in them at some previous time.

" 'As a corroboration of this statement it was found by other investigators that in a certain large carpet factory near Philadelphia 75 per cent. of the employees had been in the employ less than one year, 9 per cent. from one to two years, 5 per cent. from two to three years, 4 per cent. from four to five years, and only 1 per cent. of the employees had been in the employ more than five years. While this last example may not represent average conditions it is true that this state of affairs and that reported by Mr. Alexander are undoubtedly too common and this constant shifting of workers is a source of great industrial loss. The term "labor turnover" has been given to this change in the personnel of the factory force and it is measured as a percentage. Thus if the average number of employees for the year is 1000 and 2000 new men are hired during that period and as many are "fired," to use a shop term, the labor turnover would be 200 per cent.'

"In view of these facts I would earnestly commend this subject to our producers with the recommendation that they put their economic engineers to work on their problems of labor turnover and if they find herein a source of loss, such as many other industrial concerns have found, I am sure that an almost revolutionary turn will be taken in the organization of our motion picture production units, to the everlasting well being of the industry and all its employees."

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## Amateur Cinematography

*(Continued from Page 10)*

and it results clearly that the combination 1, has a secondary spectrum of considerable extent, while combination 2 has only a tertiary, so short as to be relatively negligible.

These facts illustrate the greatness of the improvement wrought in the construction of optical instruments, by the introduction of the new glasses, so called in opposition to the old ones in which the basic components were, as it has been explained elsewhere, in these articles, Lime and Lead, combined with Soda or Potash or both.

For practically all ordinary purposes, photographic objectives corrected for only two colours are quite satisfactory, if the choice of the two colours is made according to their actinic value, that is to say to their power of bringing about a chemical change in the emulsion sensitive to light.

In special processes such as the three colour process in which the three negatives must be not only perfectly sharp, but also of the same exact size, lenses presenting only the tertiary spectrum are indespensable.

These lenses are called APOCHROMATIC and are usually much slower than the Achromats.

An achromatic doublet, is then always formed of two glasses which have a very different value of **n**, and as in photographic lenses their power must be positive, the glass possessing the greatest value of **n** is used for the positive element of the doubtlet.

For the old glasses, the greatest was the **n** value, the lesser was the power of refraction of the glass, and therefore the crown lenses used as positive lenses had a smaller index than the negative flint used in conjunction with the positive crown to make the achromatic doublet. But in order to correct the astigmatic aberration of the doublet, it has been found necessary that the order of powers of refraction be inverted, and the flint glass be the one to have the smaller index of refraction. In other words, the glass possessing the greater **n** value should also have the greater ***n***.

This principle has been evolved by Dr. Paul Rudolph of Germany, who has called "Anomalous" the doublets thus constructed and "Normal" the ones constructed on the old principle.

Here again the importance of the new glasses is evident because the discovery of highly refracting phosphate crowns, has permitted the construction of anomalous doublets, which allow sufficient anastigmatism together with the chromatic correction, to permit the construction of photographic objectives possessing a much greater luminosity than it would have been possible to attain with the normal achromats.

The anomalous and normal doublets are also called "new" and "old" achromats according to Lummer's suggestion.

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It is quite easy to realize from the foregoing that the correction of the chromatic aberration, has no bearings on the correction of the other imperfections which a lens suffers, such as spherical and astigmatic aberrations.

An achromatized doublet even of the anomalous kind, will not suffice to give an orthoscopic image of any object, and the problems aroused by the remaining aberrations must be solved jointly, in the designing of a lens, with the problems of chromatic correction.

These problems will be analyzed in the next issue of the "American Cinematographer."

*(To Be Continued Next Month)*

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